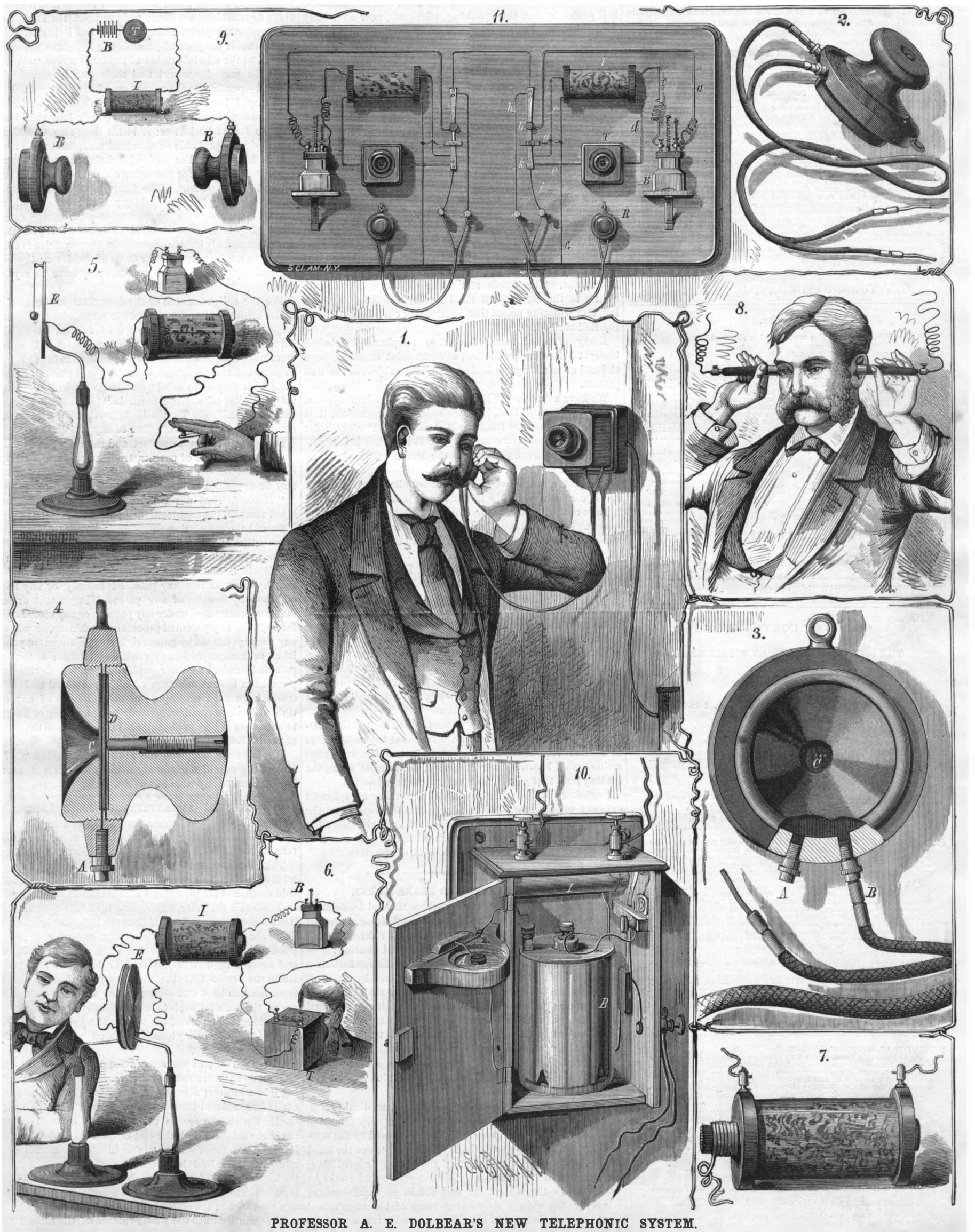
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION. ART. SCIENCE. MECHANICS. CHEMISTRY AND MANUFACTURES.

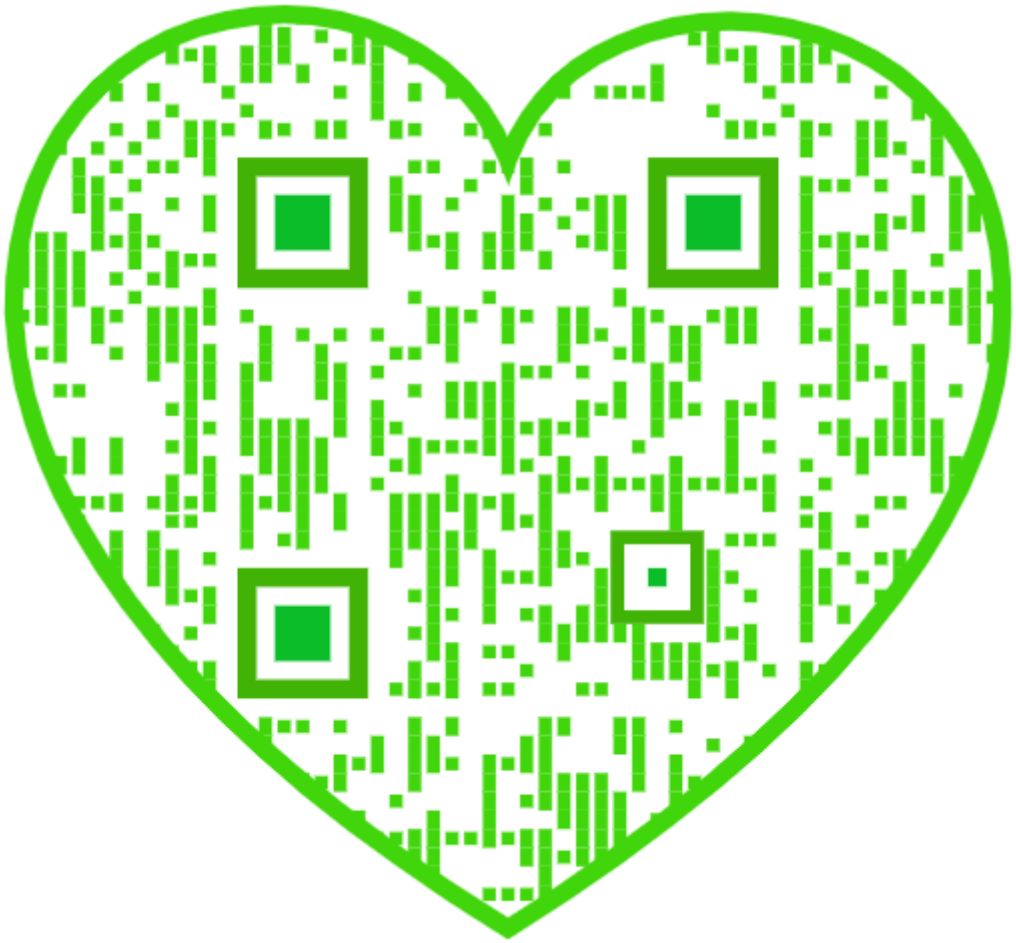
Vol. XLIV.—No. 25. [NEW SERIES.] NEW YORK, JUNE 18, 1881. [$3.20 per Annum. [POSTAGE PREPAID.]



PROFESSOR A. E. DOLBEAR'S NEW TELEPHONIC SYSTEM.

Fig 1.—The Dolbear receiver and transmitter in use. Figs. 2 and 3.—The new receiver. Fig. 4.—Section showing interior of receiver. Fig. 5.—Illustration showing electrical attraction and the electrification of a line wire by battery and induction coil. Fig. 6.—Epinus' condenser used as a telephonic receiver with Reiss' transmitter. Fig. 7.—Induction coil with removable primary coil. Fig 8.—Transmission of sounds by an ordinary medical electrical machine. Fig. 9.—Prof. Dolbear's telephonic circuit. Fig. 10.—The Dolbear experimental transmitter. Fig. 11.—Prof. Dolbear's exhibit for the Paris Electrical Exhibition.

© 1881 SCIENTIFIC AMERICIAN, INC



Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included..... $3 20
One copy, six months, postage included 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each: additional copies at same proportionate rate. Postage prepaid.

Remit by postal order. Address
MUNN & CO., 37 Park Row, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year postage free, on receipt of *seven dollars*. Both papers to one address or different addresses as desired.

The safest way to remit is by draft postal order, or registered letter. Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

NEW YORK, SATURDAY, JUNE 18, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

Agricultural inventions..... 386
Agricultural notes..... 392
Ague, amyl nitrate for..... 387
Amphora of bronze, etc.*..... 391
Arsenic, operation of..... 387
Book protector, new*..... 390
Carbonic oxide, to detect..... 339
Carlyle and his dyspepsia 386
Casting, large, another..... 386
Constipation, Swedish cure for.. 393
Copying process (3)..... 394
Corn sugar factory, gigantic... 393
Cushions, making..... 392
Discoveries in S. A., Heath's.... 391
Drainage and disease, rural..... 395
Engineering inventions..... 390
Engineers, Civil, American Soc.. 387
Engineers, Mining, Institute of.. 385
Fish, strange, feast of*..... 386
Glass, to etch (18)..... 394
Grease, to remove from clothing* 394
Gutta-percha (4) 394
Harvesters, double tongue for*.. 387
Heath's discoveries in S. A..... 391
Horses, worn-out, utilization of. 392
Inventions, agricultural..... 386
Inventions, engineering..... 390
Inventions, mechanical 389
Inventions, miscellaneous..... 390
Inventions, new..... 393
Inventions, recent..... 387
Iridium..... 392
Lead ores, argentiferous, testing 384
Lecture, Prof. Carhart's..... 386
Lump fish, the*..... 391
Mechanical inventions..... 389
Needles, to magnetize (7)..... 394
New England exhibition..... 386
Phonograph, cylinder for (15).... 394
Photo-engraving, Luckhardt's... 386
Plants, insectivorous, in Florida. 389
Rein holder, novel*..... 386
Rubber, to vulcanize to iron (16). 394
Seventy miles an hour..... 393
Silk culture in America..... 389
Smallpox, recent facts about..... 391
Smallpox, vaccination in..... 385
Starch polish, improved..... 390
Steam, wastefulness in use of.... 393
Telegraph in Arctic exploration. 393
Telephone system, new..... 384
Telephonic sys'm, Dolbear's* 383, 388
Telephony, a new system of..... 388
Timber, growth of..... 390
Vaccination in smallpox..... 385
Varnish for violins (2)..... 394
Voice, the, photographing*..... 389
Walls, brick, discolored. 386
Waterproofing cloth (1)..... 394
Water, to test (14)..... 394
Whales, fin-back, shooting..... 389
Wind motor, improved*..... 390
Wrens as insect destroyers..... 391

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 285,

For the Week ending June 18, 1881.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ENGINEERING AND MECHANICS.—The Plattsmouth Bridge.—Purpose.—Location.—General Description —Time.—Foundations.—Masonry.—Viaducts.—Deck spans.—Channel spans.—Steel floor.—7 figures and map showing the location of the Plattsmouth Bridge over the Missouri River.—Perspective view of bridge.—Diagram of bridge (to scale).—Piers.—Caissons, etc..... 4535
Building Concrete Walls.—Stability and economy of concrete walls.—Preparing to build.—Preparing the concrete.—Concrete walls under old buildings..... 4541
The Gyrograph, 2 figures.—A novel and useful instrument for drawing curves..... 4549

II. ELECTRICITY, LIGHT, ETC.—Practical Uses of Electricity. By Prof. CHAS. A. YOUNG.—Electricity as a factor of social and business life.—The nature of electricity.—Electric measurements.—Importance of electric communication.—Magnitude of the telegraphic interest.—Efficiency of the telegraph.—The telephone.—Electricity in automatic machinery.—In scientific observations.—Electric time service.—Electric Signaling apparatus.—Industrial uses of electricity.—Applications of dynamo electric machines.—Methods of electric lighting.—Multiplication of "arc" lamps.—Incandescent electric lamps.—Various types of electric lamps.—Electro-magnetic engines.—Electric transmission of power.—Plowing by electricity.—Electric railways, pile-drivers, hammers, etc.—Electric horticulture.—Household uses of electricity.—Electricity in medicine and surgery.—The Paris Electric Exhibition..... 4542
Illuminating a fish by electricity. 1 figure..... 4544
Telegraph Transmission of Picture 4544
Newton's Anticipation of Franklin's Discovery..... 4544
Curious Optical Illusion. 1 figure..... 4549

III. TECHNOLOGY AND CHEMISTRY.—On So-called Rusty Gold. 4544
Losses in the Plattner Chlorination Process 4544
On the Formation of a Chemical Compound of Ammonia with silver Bromide. By J. V. ELSDEN. 2 figures.—Forms of crystals of silver bromide in ammonia..... 4548
The Basic Dephosphorizing Process..... 4549
The Cyanamide Compounds of Succinic Acid. By Dr. H. MOLLER..... 4549

IV. NATURAL HISTORY, ETC.—Killing Weeds..... 4539
Prof. Huxley's Lecture on the Herring. Inquiries of Fishery Commissions.—Characteristics of the herring.—Food of the herring.—The herring's ancestry and physiology.—Propagation.—Allies and relatives of the herring.—The spawning of herring.—Development of the young.—Abundance of herring.—Geographical range of the herring.—Impossibility of exhausting the supply.—Capricious movements of herring shoals..... 4545
The Shad Fishery of the Atlantic Coast..... 4547
The Relative Food Value of Fish 4547

V. ARCHITECTURE, ETC.—Peterborough Cathedral. History of Peterborough. 1 full page illustration of Peterborough Cathedral. Drawn by S. Read..... 4541
Work of the Sculptor. Preparation of clay.—Source of sculptor's clay.—Putting the work in plaster.—Difficulties of casting in bronze..... 4541

VI. HYGIENE AND MEDICINE.—The Death Odor..... 4547
Grindelia Robusta as a Remedy in Asthma. By Dr. T. M. ROCHESTER..... 4548
Oleate of Mercury for the Hair. By Dr. A. H. DE YOUNG..... 4548

VII. MISCELLANEOUS.—Alabama Coal and Iron 4549
City Supplies of Charcoal..... 4540
Natural Wealth 4550
Interesting Postal Statistics..... 4550
Newark, N. J., as a Manufacturing Center..... 4550
American Butter in England..... 4550
The Great Wall of China..... 4550

A NEW TELEPHONE SYSTEM.

We illustrate this week a new and remarkable system of telephonic communication, which by its originality and efficiency promises to be of great value to the public. It embodies the discoveries of A. E. Dolbear, Professor of Physics, Tufts College, Massachusetts, whose interesting contributions to the SCIENTIFIC AMERICAN during several past years have rendered his name familiar to our readers. His additions to the general stock of knowledge pertaining to the useful arts and sciences have been very extensive, and he ranks among the most prominent of American scientists. In the department of electricity his indefatigable researches have generally kept him in advance of his cotemporaries; and had he been more observant of Patent Office formalities, it is probable that the speaking telephone, now so widely credited to Mr. Bell, would have been garnered among his own laurels. Experimental philosophy and common-place business are, however, seldom conjoined in the same individual; and the professor's contest to establish his priority in the discovery of the magnetic telephone has not yet, in law, culminated in his favor. But the world is probably the gainer, for Professor Dolbear now brings forward a new and independent system, which has important advantages over the Bell and other telephonic methods.

Prominent among the advantages of the Dolbear system are its capability of transmitting speech over long lines of wire, and its freedom from the troubles of induction. It has not yet been fully ascertained how far the Dolbear system will successfully operate; but judging from the principles on which it works and the practical experience had with it on limited circuits, it seems capable of doing effective business on lines of far greater length than heretofore have been employed. The Dolbear telephone is a silent instrument. The words and voice of the speaker come clearly to the ear without the bubbling, crackling, sputtering, and whizzing noises that so seriously curtail the use of the Bell method.

Every practical form of electric telephone heretofore brought before the public has, at some point or other, been claimed as touching the Bell system, and subject to the Bell patents.

We have said that the Dolbear is an independent system, by which we mean that, in its principles of operation, it is an absolute departure from the Bell method. For example:

In order to receive messages by the Bell system it is necessary to use, between the ear and the line wire, an electrical machine, consisting of a magnet, a metallic diaphragm near the magnet, a magneto-coil to influence the magnet, which coil is connected with the line wire and with the ground.

Take out this machine and we take out the Bell telephone system. This, substantially, is what Dolbear does. To receive a message he takes out the machine, and puts the end of the telegraph wire directly to the ear.

For convenience of ordinary use Mr. Dolbear provides the receiving end of his telegraph wire with a small handle, in which he arranges a couple of thin diaphragms, one of them attached to the wire—contrivances that improve the vocal delivery of the line wire.

Our illustrations are taken from the actual working apparatus and line as recently set up in the SCIENTIFIC AMERICAN office by Mr. Dolbear's able assistant and enthusiastic coadjutor, Mr. H. C. Buck, of Massachusetts. The practical working of this line in our office was admirable in all respects and gave us the utmost satisfaction.

The description of the new system which we publish elsewhere, written by Prof. Dolbear, apart from the instruments to which it relates, constitutes a clear, instructive, and interesting essay, in which are embraced, in concise form, the leading laws that govern all forms of electrical action.

Professor Dolbear has prepared a number of splendid exhibits of his new system, destined for display in the great International Electrical Exhibition at Paris, this summer. The invention will doubtless attract its full share of attention in that extraordinary assembly of wonders.

MEDICAL PATENTS AND TRADE MARKS.

At the recent meeting of the American Medical Association in Richmond, the report of the section on medicine contained the following curious resolution, which was referred to the Judicial Council for report at the next annual meeting:

"*Resolved*, That the spirit of the Code of Ethics forbids a physician from prescribing a remedy controlled by a patent, copyright, or trade mark. This, however, shall except a patent upon a process of manufacture or machinery, provided patent be not used to prevent legitimate competition; and shall also except use of a trade mark used to designate a brand of manufacture, provided that the article so marked be accompanied by working formulæ, duly sworn to, and also by a technical, scientific name, under which any one can compete in manufacture of same."

It would manifestly be unfair to hold the medical profession of the United States responsible for the sentiments of a resolution not formally passed upon and adopted by the association. So far as appears the resolution expresses the mind of perhaps only a small part of the section in medicine; nevertheless the fact that a resolution so worded could be presented to the association and obtain any countenance whatever, too clearly shows that some of the members at least are sadly in need of enlightenment with respect to the policy and ethics of patents, copyrights, and trade marks.

Certainly the man that draughted the resolution betrays a degree of ignorance of the function and practical working of patent rights, copyrights, and trade marks as thoroughgoing as his inacquaintance with the usages of English speech.

The wisdom of the general policy of refraining from prescribing any of the secret compounds miscalled "patent" medicines, is beyond question. But that class of alleged remedies for disease is entirely without the scope of this resolution as it stands. A patented medicine cannot be of secret composition, since one of the prime conditions of granting letters patent is that the matter patented shall be fully and explicitly published to the world.

That a physician ought to know the ingredients of whatever he offers a patient goes without telling; it is desirable also that he should know what effect the several ingredients alone or combined are likely to have upon the human economy under any given circumstances; but it is gravely to be feared that if the general practice of physicians were strictly limited to the administration of remedies under such conditions the majority would find their practice amazingly restricted—possibly to the advantage of their patients. Be that as it may, it is obviously the physician's duty to administer to his patient in any instance the remedy best suited to the case, so far as he knows; it is his duty also to widen his knowledge of probable or approved remedies to the utmost; and he has no moral or professional right to accept or reject a proposed remedy for any other consideration than the best interests of his patient. The fact that the manufacture or sale of a remedy is controlled by patent, label, or trade mark has nothing to do with the medical aspects of the case. If the remedy is better calculated to benefit the patient than any other remedy known or available, the physician is morally bound to use it, whatever the Code of Ethics or the resolutions of any professional association may have to say in the premises.

For the enlightenment of the draughter of the resolution under criticism it may be proper to remark here (1) that it is impossible for a patent to be "used to prevent legitimate competition;" consequently the exception cuts the ground from under the first clause of the resolution so far as it relates to patented remedies, and the subsequent exceptions do the same with respect to labels and trade marks. (2) That the sole function of a trade mark is "to designate a brand of manufacture." (3) That a trade mark in no way hinders competition in the manufacture of any article.

Stripped of its errors of fact and misconceptions with regard to the purpose of patents, trade marks, and copyrights, there is left of the resolution but one possible idea, which may be expressed in this wise:

"*Resolved*, That a physician should not prescribe an alleged remedy, the composition of which he does not know."

Should the association entertain and wish to express a disapprobation of patents, copyrights, and trade marks a resolution to that effect might take some such form as this:

"*Resolved*, That professional bigotry and prejudice forbid the physician to use any patented remedy, or any remedy obtained by the use of any patented implement or implements manufactured under any patent; or any remedy manufactured by any patented process or machinery, or put up in any package tainted by patent rights, or bearing a copyrighted label, or transported in any vehicle so tainted; or to use any patented surgical or other implement, or any device or implement in the manufacture of which patented tools or processes have been employed; or to make use of any copyrighted book or treatise for study or reference; or (in short) to make use of any modern means or methods in the practice of the healing art, or in preparation for such practice."

We have no fear that the associated physicians of the United States will deliberately commit themselves, even by implication, to any such absurdity.

TESTING ARGENTIFEROUS LEAD ORES.

The following will serve as an answer to a number of our correspondents asking information respecting the simplest reliable method of testing lead ores for silver:

Take out the front grate of an ordinary cooking stove with a good grate space and draught, and put in a piece of thin earthen drain pipe about nine inches in length and three inches inside diameter, supporting it on bits of brick so that it rests about two and a half or three inches above the grate. The tube should be heated in an oven or otherwise as hot as possible before setting it, so that when a fire is built under and around it, it will not snap or break into fragments. Build the fire so that the air may pass through the tube from front to back and escape through the fire without danger of the coals falling into it. Let the fire gradually increase until the greater part of the tube is at a bright red heat, the front of the tube being loosely stopped with a piece of fire brick trimmed to fit.

Weigh out on an apothecary's balance about one-tenth of an ounce of the ore reduced to a very fine powder by grinding it in a mortar; also two separate lots of one-half ounce each of granulated lead free from silver. Mix one part of the lead with the ore in the bottom of a small scorifier; cover the mixture with the rest of the lead, put the scorifier into the extemporized muffle. Close the mouth of the muffle until the lead has melted, then partly open it to let the air flow in. If the muffle is hot enough the lead will soon begin to scorify the liquefied litharge formed collecting as a ring around the sides of the vessel and gradually increasing in quantity until the whole surface of the melted metal is covered. It is well to add to the contents of the scorifier two or three pieces of borax glass (borax that has been melted in a crucible and poured out on a plate of iron to cool)

© 1881 SCIENTIFIC AMERICIAN, INC

the size of peas, if any of the gangue of the powdered ore remains floating on the top of the metal and is not slagged and absorbed by the litharge. As soon as the ring of slag closes over the metal remove the scorifier, let it get cold, then break it, and by pounding separate the slag from the button of metal.

Put a dry bone-ash cupel, weighing about the same as the button of metal obtained from the scorification, in the muffle, let it get red hot, then drop in the clean button and close the muffle until the metal has liquefied, then open it partly.

Lead under such slags off into litharge, the latter carrying with it all base metals and impurities. It is absorbed almost as soon as formed (if the muffle is properly heated) into the porous bone-ash cupel. The button gradually decreases in size, and as it gets small it must be watched, so that when the last of the lead passes off into slag and the silver (if any is present) "brightens" or assumes the luster and color of the pure metal, the cupel may be removed to avoid loss by volatilization. If the ore contained any silver a small bead of that metal will be found in the cupel; if none the cupel will be empty. Sometimes, in poor ores, the bead will be almost microscopic, so that the cupel must be carefully examined before setting it aside. Weigh the bead if found on a fine balance and multiply the weight in grains by 291,600, the result being grains of silver (with possibly a little gold) in a ton of the ore. Error may arise from the presence of silver in the test lead, so that it is always best to test it for that metal (by scorification and cupellation as above). If it is found to contain silver, and a purer sample cannot be readily procured, determine by duplicate tests as accurately as possible the amount present, and make proper allowance for this in calculating other assays in which the lead is used.

Good scorifiers and cupels can be obtained from any dealer in chemical apparatus, etc. In some instances a large French clay or even Hessian crucible with a hole knocked in the bottom can be made to serve as a good muffle for such tests instead of the clay pipe. In this case the side of the crucible becomes the bottom of the muffle, and if a little dry sand or bone-ash is spread over it, it can be made level enough to support the scorifier without tipping.

Under favorable conditions such tests can be made in an hour or an hour and a half.

RURAL DRAINAGE AND DISEASE.

BY H. C. HOVEY.

It has been estimated that more than half the deaths occurring in cities are due to preventable causes. The vital statistics of farming regions are not so easily obtained, but statements of responsible physicians, having each a large country practice, in widely separated portions of the United States, prove the importance of judicious sanitary measures in rural as well as municipal localities. One observes that "one-third of the autumnal sickness of this region might be prevented by systematic drainage of farm lands, without detriment to their agricultural value." Says another, "about fifty per cent of our sickness might be obviated by suitable sanitary precautions." All agree that a large proportion of the maladies coming under their notice are attributable to the insidious poison emanating from decomposing animal and vegetable matter.

The purest country air is less pure than is commonly supposed; a fact demonstrated to visitors of Mammoth Cave, who, on emerging after breathing for several hours the air of the cave, which is almost absolutely free from noxious gases, find the outer air laden with oppressive odors, and depressing in its influence on the system.

Miasmatic exhalations arise from every swamp, and wayside pool, from the decaying forest leaves, and many other objects that are hardly thought of as prejudicial to good health. This particular form of the evil reaches its minimum in hilly regions, where the tilted strata supply natural drainage; while its maximum is found in such extensive areas as exist in Indiana, Illinois, and other portions of the West, where vast deposits of alluvial and lacustral soil cover nearly level sedimentary beds, allowing but very sluggish removal of marshy accumulations.

The cultivation of the surface soil, and the drainage made for agricultural purposes, have gradually redeemed large tracts of wet land in the regions mentioned; yet much remains to be done, and it is gratifying to see that steps are being taken by some of the States embracing prairies and broad river bottoms, to investigate the relation between the hydrographical features of the country and the prevalence of malaria and zymotic diseases.

State and local health commissions are instituted with authority to collect vital and sanitary statistics, and to have charge of public measures for removing the causes of disease from all parts of the State; omitting, however, two very important links from the chain of a perfect organization; namely, police power to enforce good health laws in rural districts, and means to defray expenses of straightening crooked streams, to increase the velocity of the current, digging canals to relieve wet lands from overflow, and doing other things that might cost a considerable sum of money, but would add largely to the reputation of the State for salubrity, and thus bring a rich reward.

The first annual report of the Health Commission of one of our largest and most populous interior States has lately appeared, full of facts as to the deficient sewerage of cities, and its almost utter neglect in smaller towns and villages, and in rural localities; also showing the inevitable connection between these causes and the prevalence of forms of sickness that might be entirely avoided by a comparatively small outlay. And what is true of Indiana would also be found to be true of other States similarly situated as to a lack of natural drainage.

Look at the still more level State of Illinois, with its vast prairies and fertile bottoms. The sewage of all the cities is emptied into the adjacent streams, which have usually a sluggish flow, and it is hardly asked whither the reeking mass is distributed.

Often this seems to be the only available mode of getting rid of it, all experiments looking toward other methods meeting with but slight success. It is to be hoped that some apparatus like the "garbage destructor and carbonizer" described in a late number of the SCIENTIFIC AMERICAN, will be introduced into all large cities for the consumption of refuse without sending it down some stream to contaminate the surrounding country.

About ten years ago the course of the Chicago River was artificially reversed, so that instead of running as it had done for ages into Lake Michigan it emptied itself and its accumulation of street filth and offal into the Illinois River, coursing completely across the State. The beneficial result to the city was very great; but for 150 miles down the Illinois River loud complaints were made of a marked increase of zymotic diseases, and a remarkable mortality among the fish in that stream seemed to prove that the water had been poisoned. The fact is worth noting, in passing, that the fish appeared to grow used to the changed condition of affairs; but during the past winter the ice bound water not being properly oxygenated for a long time, many fish died, while others in immense numbers congregated below the dam at Henry, where the constant agitation of the falling water would favor aeration. And at the same time there was an alarming prevalence of diphtheria at Peoria and other places along the river.

This illustration shows the importance of State regulation of general drainage, so that what is borne away as a nuisance from one locality shall not be cast as an offensive burden on another.

But suppose all to have been done that can be effected by public health organizations, much will remain to be accomplished by individual effort, in response to appeals to an enlightened instinct of self-preservation.

Many farmers, otherwise well informed, do not seem to realize the fact that gases arising from stables, pigpens, and out-houses may poison the pure country air as effectually as the atmosphere in cities may be spoiled for breathing by the same effluvia spreading from neglected alleys or cesspools. And the thrifty wives of farmers, who, forgetful of cleanliness, saturate the door yard with wash water and kitchen sewage through all the winter months, should be taught that when that ground sours and festers under the summer sun, the heat will ripen the germs of disease as surely as it will ripen the grain in the harvest field.

Maladies mysteriously affecting families residing in what are regarded as healthy localities, are often explainable on opening the cellar door, whence an intolerable odor of decaying vegetables proceeds; or on lifting a board in the kitchen floor, beneath which is a shallow pool of standing water; or on observing that the well is so situated as to drain into itself some of the substances that are thrown away as utterly unfit to be retained in proximity to human beings.

The latter point is one very frequently overlooked. For example, a certain Western city, finely located and attractive, gained the reputation of being an exceedingly unhealthy spot, and was of course much retarded in its prosperity by that fact. Finally it was noticed that underlying the city, at a depth of about twelve feet, is a stratum of impervious blue clay, above which lies an extensive quicksand, affording an abundant water supply by means of numerous wells, and into that same quicksand all the vaults and cesspools of the place were also dug, thus mixing their foul contents with the drinking water that every one used! The amount of sickness was materially diminished by the proper attention being given to this one point. Every careful farmer will see that the compost heap, and other refuse stored as food for the roots of grasses and vegetables, shall be at such a distance from the house and well as not to contaminate the air and the water essential to the preservation of life and health.

In closing, I may mention a curious illustration, given in a paper by Prof. E. T. Cox, on the "Influence of Geology on Local Diseases," showing what has actually been done by rural drainage to eradicate a dreaded malady that used to prevail extensively in Kentucky and Indiana, known as "milk sickness," because, first attacking cattle, it was communicated to human beings through the milk, butter, and beef of the infected animals. Many a brave pioneer lost his life by this malady, which almost always proved fatal; and recovery was usually lingering and imperfect. At first it was supposed that the cattle had eaten some poisonous plant; but every suspected grass and weed proved harmless on scientific examination. Then it was held that mineral poisons must lurk in the springs and brooks; but hundreds of samples were analyzed without detecting the presence of the enemy. At last an investigation of the clay shales, soft rocks formed from ancient mud beds, and which are microscopic in an eminent degree, revealed the secret. These formations abound in every infected locality, and it now seems clear that they exhale some sort of miasma, when saturated with water, that originated or aggravated the disease, just as other kinds of malaria bring on chills and fever. Proceeding on this discovery, thorough drainage of the wet lands adjacent to the shale beds dried them sufficiently to terminate the conditions favorable to the spread of milk sickness, so that it has now almost entirely disappeared from regions that once were cursed by that plague.

The opinion is now established that a large proportion of diseases are of germ origin; and the obvious mode of prevention is the destruction of the germs or their timely removal.

VACCINATION IN SMALLPOX.

Jenner's great discovery of vaccination for prevention of smallpox has not been wanting in opposition, and a few persons are still so stupid as to object to vaccination. These people, who refuse to be vaccinated themselves or allow their children to be, endanger not merely their own lives, but the lives of their neighbors. They furnish the fuel on which the flames feed, and render epidemics of smallpox possible. If vaccination were universal it would be as difficult to get up a smallpox pestilence as it is to start a great fire in those cities where all the buildings are practically fireproof.

While the efficacy of previous vaccination with good virus is well known to be a preventive, the uses of vaccination after the disease has been contracted are less understood. Some years ago a Virginia physician, Dr. Alban S. Payne, conceived the idea of vaccinating a smallpox patient with the kine-pock. It took at once. The next day he repeated the vaccination, and that also took effect. And what was the effect upon the smallpox of having another similar disease in the system at the same time? The eruption was less extensive, but few pustules appeared, no scars were left, and in a surprisingly short time (three or four days) the patient was able to be about the room. In hundreds of cases where the system of daily vaccination was practiced by Dr. Payne, the duration of the disease was shortened, and *no deaths occurred.* Why, one would ask, is not this simple precaution always taken, if by its means life may be saved, pitting prevented, and suffering diminished? We should be glad to hear from other practitioners who have tried the method above described.

Institute of Mining Engineers.

The American Institute of Mining Engineers met at Staunton, Va., May 30. The members present included President William Metcalf, of Pittsburg, Penn.; Dr. R. W. Raymond, of the School of Mines, Columbia College, New York; Dr. Thomas Egleston, of the School of Mines, New York; Dr. Dudley, chemist of the Pennsylvania Railroad Company; Professor P. Frazer, of Philadelphia; Dr. T. Sterry Hunt, of Montreal; J. A. and J. T. Burton, of Troy, N. Y.; W. P. Ward, of Savannah, Ga.; and F. S. Witherbee, of New York.

In his annual address President Metcalf spoke of the advance of science and its results, and of the education of engineers. Special stress was laid upon the continuous study of the higher mathematics and practical observation as means of self education and professional success. A paper by J. H. Mackintosh, on "The Electrolytic Determination of Copper," was read by Prof. Egleston, and discussed by several members. Dr. Frazer read a paper on "The New Geological Map of Chester Co., Pa."

The opening paper of the second day was by Professor Egleston on "The Ore-Knob Copper Process," employed at the mines of the Ore-Knob Copper Company in North Carolina. The belief was expressed that a great amount of copper lay dormant in the South, which, if properly worked, would be as profitable as the lake copper. Major Hotchkiss, of Virginia, thanked Professor Egleston for drawing attention to the copper deposits of the South. Very few persons are aware of the great wealth in this mineral with which this State abounds. Forty years ago Richard Taylor made explorations and reported on this class of ore. The only difficulty in its development then was the lack of transportation facilities. That objection does not now exist, and this industry may be expected to be seen coming prominently to the front.

A paper prepared by F. H. Williams, of St. Louis, Mo., on "A Volumetric Method of Estimating Manganese in Pig Iron and Steel," was read by the secretary. It was an adaptation of the known processes. In connection with it was presented a paper on "Manganese Determinations in Steel," prepared by William Kent, of Pittsburg, Pa. These papers were discussed by Drs. Drown, Sharpless, and Dudley. In reference to the subject of steel rails letters were read from Richard Akerman, of Stockholm, Sweden, and C. P. Sandberg, of London, England. The latter showed a preference for the mechanical over the chemical tests of steel rails, though he recognized the full importance of both. Considerable discussion ensued upon this subject, the principal participants being Drs. Raymond and Dudley.

At the afternoon session Dr. Sharpless, of Boston, made a statement with reference to the black band iron ores of West Virginia. F. P. Dewey, of Tennessee, read a paper on "Rich Hill Iron Ores." O. J. Heinerich, of Drifton, Pa., explained the practical working of the ammonia soda process, and Stuart M. Buck, of Virginia, read a paper "On the Hard Splint Coal of the Kanawha." After an explanation of the geology of the valley by Major Hotchkiss, the institute adjourned.

At the night session Professor Frazer, of Philadelphia, read a paper on "Observations on some of the Ores of the Upper James River." This was followed by Major Hotchkiss in a description of the topography and geology of the Virginia Valley.

The programme for June 1 was devoted to an excursion over the Shenandoah Valley road to the Luray Cavern, with an examination of the rich mineral deposits of the valley.

© 1881 SCIENTIFIC AMERICIAN, INC

Luckhardt's Process of Photo-Engraving.

This process, which has been rightly called a "Columbus' egg," like so many others, owes its origin to chance. Being requested, at a few hours' notice, to draw a portrait for a circle of friends, I intended to use as a guide a photograph, the printing of which was, however, delayed. The idea then occurred to me to coat the negative, which was at hand, with yellow varnish, and to etch the portrait with the needle on that ground. As I wished to make a caricature, the salient characteristics of the negative were retained as a foundation, the transparent parts etched out, and the clothing altered. In this way the photo-engraving was produced, the further use of which, I believe, is not to be undervalued. In view of the circumstance that the drawings and wood cuts of portraits which appear in the illustrated papers have frequently lost the likeness of persons whom they represent, and that notwithstanding they are costly and require a long time to produce, would it not be advisable to use engraved photographs instead, even when the original negative, taken from nature, is not to be had, but only a negative reproduced from it?

The yellow varnish—consisting of common negative varnish to which a suitable quantity of aniline yellow has been added until it has assumed a dark sherry color—may be graved very well for a few days; but the older the varnish film the more brittle it becomes, and, therefore, a few drops of castor oil are added to it to render it elastic. The action of light upon sensitive paper placed beneath the negative is effectually suspended by the yellow varnish, so that only the transparent lines, produced by the graver, print. When once the principal lines of the original picture have been faithfully laid down, even an untaught draughtsman may produce an engraving of the portrait that shall at least have some resemblance; while a draughtsman skilled in cross-hatching or a xylographer should furnish a work which, placed beside a good woodcut, should exhibit a superiority recognizable even by the unprofessional eye. Besides the rapidity with which the engraving can be made, the possibility of the utmost correctness is offered, since lines which have been too deeply graved or wrong lines may be filled up again with yellow varnish and engraved anew, a printing frame and silvered paper offering a convenient method of watching and controlling the progress of the work. Where broken lines are desired a pencil may be passed over them, and then they may be pricked and so on. By transfer paper an impression from an engraved, yellow varnished negative plate may be transferred to zinc, and in this way a plate suitable for printing with the letterpress printing press will be produced.

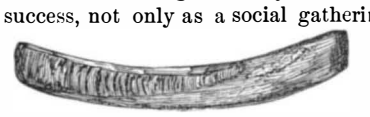
The portrait of Dr. Emil Hornig, the President of the Photographic Society of Vienna, issued with the current number of the *Photographische Correspondenz*, was engraved in about an hour, the faultless zinc *cliché* being produced in a surprisingly short time, in the chemigraphic establishment of Herren Angerer and Goschel, so that in a single day a negative, the engraving, and the *cliché*, ready for printing from, may all be produced with ease.

As I never before made a drawing for a woodcut nor engraved a portrait, I must add that I by no means consider the portrait of my honored friend as a work of art; but my first attempt having attracted some attention in the Vienna Photographic Society, I was induced to prepare the present portrait for its organ. I hope the process may soon meet with extensive application at the hands of capable artists.—*Fritz Luckhardt, in Photographische Correspondenz.*

FEAST OF STRANGE FISH.

BY A. W. ROBERTS.

The second annual dinner of the Ichthyophagous Club, which was held on the evening of Friday, the 28th ult., was a complete success, not only as a social gathering, but for



Razor Clam.

the more important and practical object of developing hitherto neglected varieties of fish for human consumption.

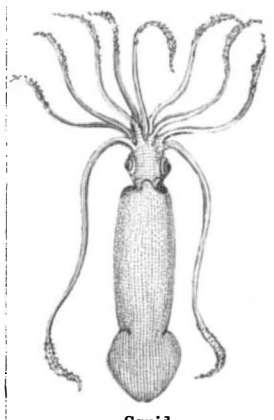
Among the company, which numbered nearly one hundred guests, were men distinguished in the world of arts, of letters, and of science, and not a few who are deeply versed in the mysteries of the ocean. The tables were ornamented with flowering plants, and designs composed of materials collected from the sea, the most noteworthy being a pyramid, twenty feet high, consisting of the empty shells of the horseshoe crabs, between which were introduced sharks' fins and sea robins' heads.

King Crab.

While the gathering was naturally social in its character, the practical result accomplished was the utilizing for food of certain fishes which have been considered the very refuse of the ocean. Strange and repulsive-looking creatures (the most striking of which I have figured) were served up during the evening as the choicest of viands. These various dishes of strange fish were partaken of with a relish, which, until the experiments of last year and this were made and proved successful, were considered valuable only for fertilizers or curiosities for aquaria.

The consomme of moss-bunker was very palatable and entirely free of all oleaginousness.

The "Bisque of razor clams" was as delicate in flavor as



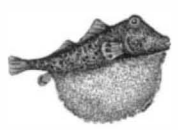
Squid.

Hell-bender.

oyster soup. "Gray snapper a la Blackford" was another equally palatable dish. Although the gray snapper is not equal in flavor to the red snapper, there is no reason why it should be neglected by our fishermen, as it generally is, as a marketable fish.

"Horseshoe crabs a la diable" were served from dishes composed of the empty shells of the horseshoe or king

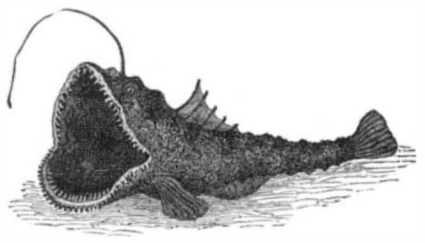
Sea Robin.



Blow Fish.

crab. The flesh of this crab was found to be coarser and more stringy than that of the ordinary crab, and the flavor more pungent, but not sufficiently so as to make it unpalatable.

"Drumfish a la Cope" was very suggestive of sheepshead. The drum fish is never to be found in our markets,



Lophius a la Beard.

and in the severest sense is looked upon as an "evil" fish by the fisherman, it being one of the greatest enemies to the oyster.

"Saute of shark, Chinese style," was not very successful, as the portion that I partook of left a disagreeable taste in

Sea Lettuce.

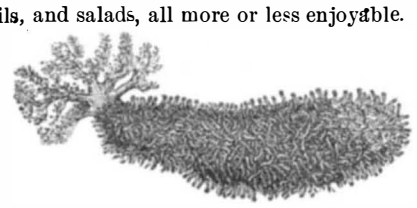
Spider Crab.

the mouth, though others declared it equal to halibut steak; perhaps I got the evil part of the beast.

"Squid a la Starin." Without exception the squid is one of the most repulsive-looking animals of our coast, and yet

Skate.

from it was produced a black colored and gelatinous soup, which, if you could forget the disgusting form of the creature, was very pleasant to the taste. Next on the menu came hell-benders, sea robins, "Lophius a la Beard," and blow fish, with sea-lettuce salad, from which were produced fries, broils, and salads, all more or less enjoyable.



Sea Cucumber.

On last year's menu were spider crabs, gar fish, skate, and sea cucumber, of which strange looking creatures some idea can be formed by the accompanying illustrations.

In some future number detailed accounts of the habits and uses of many of these fish will be given.

The New England Exhibition.

The New England Manufacturers and Mechanics Institute are making a special effort to secure this year an adequately representative exhibit of the products of New England industry and skill. The Exhibition building, now nearing completion, is the largest building in New England, covering five acres of ground and offering over eight acres of flooring available for exhibition purposes. It is situated in Boston, on a spur track of the Boston and Providence Railroad.

Space has already been assigned to a considerable number of prominent industries. The exhibit of the boot and shoe trade is expected to be more extensive and complete than has ever been made before. It will comprise a model factory with 129 distinct machines in operation.

The office of the Institute is at No. 5 Pemberton Square, Boston.

Prof. Carhart's Lecture.

In the notice of Prof. Carhart's recent lecture before the New York Electrical Society it was incorrectly stated that the Crookes experiments had not before been publicly repeated in this country. The same lecture, with illustrated experiments, was given by Prof. Carhart before the Chicago Electrical Society, last winter, January 24.

Carlyle and His Dyspepsia.

In his "Reminiscences," Carlyle tells how he once rode sixty miles to Edinburgh, "to consult a doctor, having at last reduced my complexities to a single question. Is this disease curable by medicine? or is it chronic, incurable except by regimen, if even so? This question I earnestly put; got response: 'It is all tobacco, sir; give up tobacco.' Gave it instantly and strictly up. Found, after long months, that I might as well have ridden sixty miles in the opposite direction, and poured my sorrows into the long, hairy ear of the first jackass I came upon, as into this select medical man's, whose name I will not mention."

Discolored Brick Walls.

The white saline substance that "comes out" upon brick walls, and which has been a source of annoyance to a great many, may, according to the *American Architect*, be remedied. In reply to a query on the subject, it says: The "saltpetring" of brickwork can generally be prevented by adding oil to the mortar, at the rate of a gallon to the cask of lime. If cement is used in the mortar, an additional gallon of oil must be allowed for each cask of cement. Linseed oil is generally employed, but any kind which does not contain salt will answer. The incrustation, once formed, can be removed with hot water, or by the muriatic acid generally used for cleaning down brickwork, but it will reappear again by exudation from the interior of the wall, and usually leaves a permanent black or brown stain.

Another Large Casting.

The large iron bed plate for the Fall River steamer Puritan, cast at the foundry of John Roach & Son, in this city, May 17, will be, when trimmed and completed, 21 feet 9 inches long, 12 feet 6 inches wide, and 3¼ inches thick. The mould was 37 feet long, 14 feet wide, and required 2,000 feet of timber for the frame. It was roofed with brick.

AGRICULTURAL INVENTIONS.

An improved corn sheller with which an ear of corn can be shelled very rapidly and perfectly without crushing or bruising the kernels and without any great exertion of power on the part of the operator, has been patented by Mr. Charles F. Shaw, of Boston, Mass. It consists of two semi-annular sections, each provided with an arm, the arms being pivoted to each other at the outer ends, so that the sections can be swung open or closed. These sections each have a series of teeth, all tapering toward the same point, fastened to the inner sides, so that an ear of corn is passed in between the semi-annular sections, and the latter are held tightly while the ear is being rotated to and fro. The teeth will tear the kernels from the cob.

An improved butter worker has been patented by Mr. John McAnespey, of Philadelphia, Pa. The invention consists in a body having rim and boss, a shaft passing through the body and connected by a gear with a hand crank shaft, a cross piece provided with a median square hole fitting a squared part of the body shaft, and beveled rolls arranged on journals of cross piece.

© 1881 SCIENTIFIC AMERICIAN, INC

The Operation of Arsenic.

Arsenic has been long and generally in use as poison and as cure, yet no satisfactory explanation has been offered for its varied effects. Almost every part of the system is subject to its blighting or healing influence; it produces no sensible effect at the place where it is received into the system; small quantities produce poisonous effects, accumulating till the fatal point is reached, while larger does taken for long periods produce a coveted freshness.

Liebig refers these effects to the readiness with which it enters into combinations with the organic matters and to its power of preserving them from decay. If they do not decay it is because they have lost that essential character of living matter, the power of undergoing transformation; hence as parts or whole they are dead.

But the preserving effect of arsenic upon corpses seems to be rather traditional and to lack sufficient foundation. Attention has not been paid in the cases recorded to the nature of the soil, and the condition of other bodies buried near by.

Two German investigators ascribe arsenical effects to the activity of oxygen atoms in connection with arsenic. The corrosive power of common iron rust is well known. The iron oxide gives off an atom of oxygen, which being in the nascent state acts vigorously upon the organic matter with which it may be in contact. But another atom of oxygen combines with the iron and is again imparted to the organic matter, this process being constantly repeated with destructive effect.

The same play of give and take occurs with the arsenic. Arsenic acid loses an atom of oxygen and becomes arsenious acid; the latter takes an atom and becomes arsenic acid again. If either acid be injected into the intestines the other is soon found to be present.

These changes, it is believed, give sufficient basis for the natural explanation of all the medical effects of arsenic.

DOUBLE TONGUE FOR HARVESTERS.

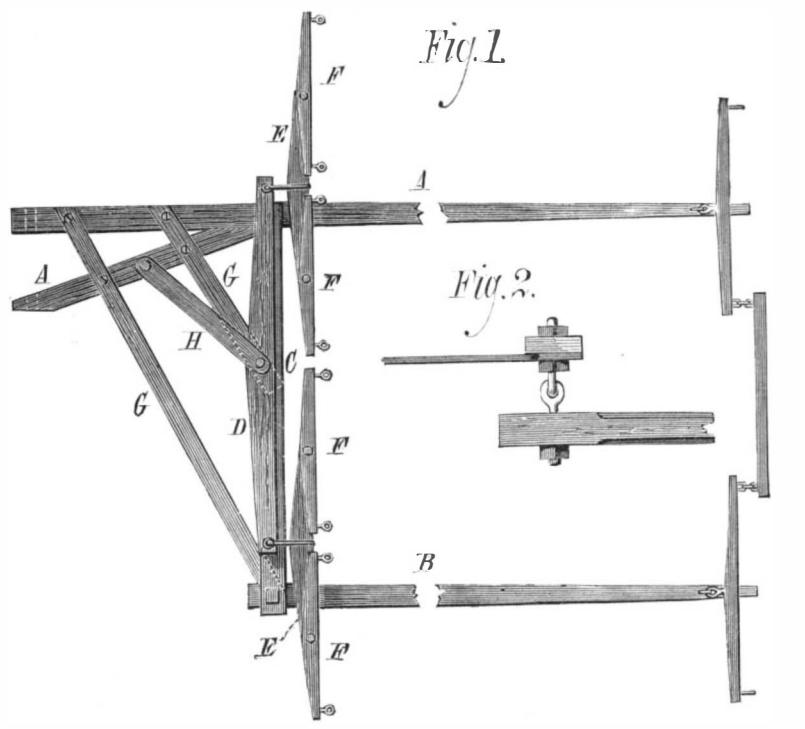
The improvements which have been made in harvesting machines, in the past few years, have made them so nearly perfect that there seems to be no room for further improvement as to their working, but so much has been added to their weight that now the great difficulty with farmers occupying somewhat hilly land is to apply team enough to do the harvest work quickly. It is impracticable to drive one pair of horses before another, as in the old reapers, because the driver's seat is so far at the rear end of the machine that he cannot reach his leaders, and has no control over them, and serious accidents happen from this cause. It is the practice of some to have a boy ride one of the leaders, while the man who manages the machine drives the rear team; but this is found to be very unsatisfactory. Others drive three horses abreast, having a relay in the field, and changing every two or three hours.

Mr. John J. Kepner, of Little Valley, Minn., having tried these several ways, and finding them all unsatisfactory, was led, in the harvest of 1879, to try driving four horses abreast, as illustrated by the engraving; and having again used the same device, improved, through the entire harvest of 1880, claims that, with this harvester double tongue, any one who is capable of driving two horses can drive four, and have them under perfect control, and do as much or more work, and do it with more ease to man and team, than can be done in any other way.

When the land is so level that three horses can handle an ordinary harvester, by using this device the capacity of each machine can be increased one-third, by simply adding to the length of the cutter bar. By removing one nut, and laying aside the movable tongue and four-horse evener, the machine can be used as a two or three horse machine. The side draught can be so regulated that the machine follows the team freely, like a wagon, or it can and should be adjusted so that it hugs the standing grain closely, so as to always cut a full swath.

The ordinary tongue, A, is connected with the harvester in the usual manner, and to it, at a little distance from its rear end, is attached the end of the crossbar, C. The connection between the tongue, A, and the crossbar, C, is strengthened by the inclined braces, G. The end of the rear or long brace is attached to the tongue, A, near its rear end. The other end of the brace is attached to the outer end of the crossbar, C. The end of the forward or short brace is attached to the tongue, A, about midway between the ends of the crossbar, C, and the longer brace. To the crossbar, C, about eighteen inches from the tongue, A, as the draught of the harvester may require, is pivoted the four-horse evener, D, by a bolt, strengthened by a hammer strap, H The rear end of the hammer strap, H, is hinged to the hound of the tongue, A. The four-horse evener, D, is provided at each end with a two-horse evener, E, which is provided with single trees, F, in the ordinary manner. The rear end of the second tongue, B, is connected with the outer end of the crossbar, C, by interlocked eyebolts, the upper eyebolt serving also to secure the end of the brace, G, to the end of the crossbar, C. With this construction it is necessary that the forward ends of the tongues should be so connected that they cannot be forced apart by the side pressure of the horses in guiding and turning the machine.

For further information address the inventor and patentee as above.

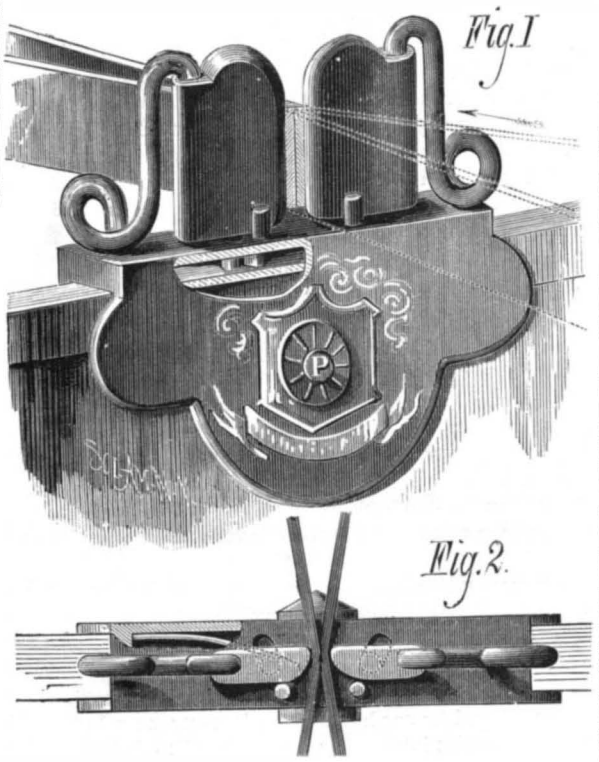


KEPNER'S DOUBLE TONGUE FOR HARVESTERS.

NOVEL REIN HOLDER.

The engraving shows an improved rein holder patented by Mr. Jonathan S. Pitcher, of San Diego, Cal., and designed for attachment to the dashboard or any other convenient part of the vehicle. It consists of two posts attached to a supporting plate, and each carrying a cam, which is pressed forward by a spring and prevented from moving too far by a stop pin. The upper and inner corners of these cams are rounded so as to permit of readily inserting the reins between them. The plate supporting the cams will generally be made double so as to clasp both sides of the dashboard, but a single plate may be used in some cases where it becomes necessary to attach the device to some support other than the dashboard. The reins are inserted in the holder by drawing them rearward between the cams and then releasing them. Any attempt to draw the reins forward will result in rendering them more secure. By pulling the reins rearward they are readily detached.

The device will work well if one of the cams is omitted, but the inventor prefers the double arrangement of cams.



PITCHER'S REIN HOLDER.

The advantage of this holder over the usual method of holding the reins will be readily understood and appreciated by those who drive, either constantly or occasionally.

For further information address Mr. W. L. Williams, San Diego, Cal.

Amyl Nitrate for Ague.

Dr. Saunders, of Indore, India, reports in the *Indian Medical Gazette* a number of cases of ague successfully treated with nitrate of amyl. He asserts that in every instance the disease yielded quickly and permanently to the amyl treatment. He mixed the drug with an equal part of oil of coriander to make it less volatile and to cover its odor, and administers as follows: Four drops of the mixture, or two of amyl, are poured on a small piece of lint, which is given into the hands of the patient for him to inhale freely; he soon becomes flushed, and both his pulse and respiration are much accelerated, and, when he feels warm all over, the inhalation is discontinued, as the symptoms continue to increase for some time afterward; a profuse perspiration now sets in, which speedily ends the attack, though in some cases the cold stage merely passes off without any hot or sweating stage.

American Society of Civil Engineers.

The thirteenth annual convention of the American Society of Civil Engineers will begin in Montreal, June 15. Arrangements have been made to have such of the members as desire to do so meet at Niagara Falls, on Saturday, June 11, and examine the new suspended structure of the railroad suspension bridge and the re-enforcement of its anchorage. A paper on this subject will be presented at the convention by L. L. Buck, Member A. S. C. E., the engineer in charge of the work.

After spending Sunday at Niagara the party will proceed to Toronto, and after a short stay at that city, will go to Montreal by a steamer, on Lake Ontario, passing on Tuesday the Thousand Islands and the Rapids of the St. Lawrence, and arriving at Montreal the evening before the day of the opening of the convention.

The following papers are announced for presentation during the convention: "Re-enforcement of the Anchorage and Renewal of the Suspended Structure of the Niagara Railroad Suspension Bridge," L. L. Buck; "The Stability of Tunnels in River Silt," Ashbel Welch; "Repairs of Masonry," O. Chanute; "Experiments upon Strength of Wrought Iron Columns," T. C. Clarke; "On Weights and Measures," Charles Latimer; "Comparative Economy of Light and Heavy Rails," Ashbel Welch.

RECENT INVENTIONS.

An improvement in gates has been patented by Mr. Alfonzo P. Campton, of Rohnerville, Cal. The object of this invention is so to construct a gate and its attachments that it can readily be opened by a person approaching on horseback or in a vehicle.

An improved dynamo-electric machine which is adapted for use for various purposes, and particularly for electroplating and analogous arts, has been patented by Mr. Hans J. Müller, of New York city. The invention is an improvement in the class of machines in which a series of armature coils are attached to a shaft rotated by power suitably applied, so that they rotate between fixed and opposing field magnets, and thereby generate the current. The invention consists in combining a relay and a resistance with a series of rotating armatures and fixed field magnets, whereby the reverse or secondary current (originating in the bath of plating solution) is caused to pass through the magnets in the same direction as the main current. The relay regulates the permanent charge of the machine.

A bracelet, combining strength and flexibility, capable of easy adjustment to the arm, and incapable of becoming accidentally unclasped, has been patented by Messrs. Leon P. Jeanne, of New York city, and Paul Jeanne, of Greenville, N. J. The bracelet is made of a narrow thin strip of metal wound closely and spirally about a chain and provided with a novel device for adjusting and fastening the bracelet.

An improvement in that class of rocking chairs in which the seat and back rock upon a platform against the tension of a spring, has been patented by Mr. William E. Buser, of Chillicothe, Ohio.

An improved hame loop has been patented by Mr. Alpheus Arter, of New Lisbon, Ohio. The object of this invention is to furnish a convenient means for adjusting the strap by which two hames are connected together at the top.

An improved convertible valise has been patented by Mr. Mahlon Loomis, of Washington, D. C. The object of this invention is to provide for use of travelers an improved form of valise which shall not only be adapted for containing apparel, toilet articles, etc., like an ordinary valise or traveling bag, but also for suspension vertically from the back of a car seat or other support within folding panels or shelves, may be lowered for use in taking lunch, or playing games, etc.

An improved wheat steamer and drier has been patented by Mr. Cyrus T. Hanna, of Pittsburg, Pa. The invention relates to a process and apparatus for steaming and heating grain and feeding it to the grinding stones hot, so that it may be ground while hot, so that a better article of flour may be produced.

Mr. Hans J. Müller, of New York city, has patented an improved dynamo-electric machine. The object of this invention is to provide a new and improved dynamo-electric machine, which is so constructed that a series of separate and independent currents can be produced, of which one is used to excite the field magnets and at the same time perform work in the external circuits, while the other currents perform work in the external circuits only.

© 1881 SCIENTIFIC AMERICIAN, INC

A NEW SYSTEM OF TELEPHONY.

BY A. E. DOLBEAR.

That rubbing a piece of amber will endow it with the property of attracting other bodies has been known from remote times, and it is probable that this phenomenon was the only electrical one known until comparatively recent times. Sulphur, wax, glass, and a few other substances were found to possess the same quality, and latterly it has been discovered that every substance whatever when subjected to friction from a different kind of substance than itself is capable of attracting light bodies in the same way as amber and as glass. The difference is one of degree only.

Another phenomenon due to the electrical excitement of bodies by friction is, they attract each other stronger than they attract other bodies, while each of the excited substances will repel a similar body excited in the same way.

But there are other ways of generating electricity that are familiar enough nowadays; for example, the galvanic battery; but this does not exhibit the attractive property of the piece of rubbed glass in a way that is appreciable by ordinary means. A well excited piece of glass will make a pith ball to move toward it from a distance of a foot or more. But let the pith ball be brought very near to any part of a battery or a wire attached to a battery, and no appreciable motion will take place. If, however, the wires connecting the terminals of the battery be wound into a helix that incloses a piece of iron, the latter will be made a magnet by the current of electricity in the wire, and this magnet will attract other bodies.

A very strong magnet will attract any body whatever, even a pith ball or a piece of hard rubber, but the strongest electro-magnet hitherto made will not attract such a substance to itself from a distance of half an inch. The attractive property manifested by the iron is called *magnetism*, and the corresponding property of the glass that has been subject to friction is called *electrical attraction*.

While it is true that a current of electricity in the wire conductor of a battery is capable of developing an attractive property in the iron, it is also true that the terminal wires of the battery, when they are not connected, manifest an *electrical* attraction, for if they be properly connected to a sensitive electrometer the latter will show them to be electrified, one positively, the other negatively; and in order to understand better what is subsequently stated, it will be best to dwell a little while upon this phenomenon.

It has been stated above that all substances may be rendered electrical by friction, but for conductors of electricity like the metals friction is not essential; it is only necessary to *touch* one metal to another or to a fluid, like water, when one will be found positive and the other negative. Thus if a piece of copper is touched to a piece of zinc, the copper will be found to be positively electrified and the zinc negatively; if the copper is touched to water the latter will be positive and the copper negative; while if the zinc be touched to the water the latter will still be positive, but the zinc will be more negative than the copper was. Now these differences of electrical condition are called differences of potential, and difference of potential is electromotive force, or the condition which results either in electrical attraction or in a current of electricity in a suitable conductor. A great number of facts lead one to the belief that whenever two different substances are placed in contact there an electromotive force is developed, electricity is generated; and the probable explanation of this is that the atomic and molecular motions of two differently constituted bodies cannot be exactly alike, that is, they cannot be taking place at the same rate in both bodies. The molecules of a dense body cannot be moving as fast as those of a less dense body, and when these differently moving molecules are placed in contact with each other there must be some rearrangement of their motions at the points of contact, and the readjustment is quickly distributed by reaction throughout the whole body if it be what is called a good conductor, and more slowly in a poor conductor, but after such distribution there is no further action, unless some means is provided for maintaining fresh surfaces of contact. In the galvanic battery this is effected by the gradual solution of the zinc, by which the surface molecules are removed, thus presenting a fresh surface for renewal of the original conditions. As the electrity thus generated tends to go from the element with the higher potential to the lower one there will be what is called a *current* through any conductor that connects them so long as the solution of the zinc goes on, but break the wire that connects the two metals and the current will stop, and the ends of the wires will be found to be electrified, one positively, the other negatively.

But electricity may be generated in other ways still, and the method discovered by Henry more than forty years ago is second to none in scientific interest as well as practical use. It is this: that whenever a current of electricity in a conductor is started or stopped, or in any way varied, another current will be generated in an adjacent conductor, but it will have a direction opposite to that of the originating current. This is the foundation of what is now called *inductive coils* or inductoriums. These consist of two coils of wire, one with only a few turns of larger insulated wire wound over a bundle of iron wires, the other coil being wound outside of the first or primary coil, and consisting of a great many turns of very fine wire. The primary coil may be connected to a battery, as in Fig. 5, first page, while the terminals of the secondary coil are generally made fast to some hard rubber mounting, as in Fig. 7. When a current of electricity is permitted to traverse the primary coil the induced electromotive force in the secondary coil raises one terminal to a higher potential than the other; that is to say, one terminal is positive, the other negative; and if a wire connects these terminals a current will flow through it from the positive to the negative terminal. If a galvanometer be connected to them the needle will be deflected by the current. Indeed it is not necessary to have the wire terminals quite touch each other, for if the electromotive force be great enough a spark will pass from one to the other, the spark being a part of a transient current, and consisting of some of the material of the terminal that has been torn off, and is transferred to the other terminal because it is electrified positively, and is, therefore, attracted by the other terminal, which is negatively electrified. That the terminals are electrified at such times may be proved by bringing a pith ball suspended by a thread near to one of them, or attaching one of the brass disks of an Epinus's condenser by a wire to the terminal, as E in Fig. 5. Each make and break of the battery current will make the pith ball move toward the disk. This principle of the attractive power of an electrified body for other bodies is the basis of the new speaking telephone about to be described.

THE RECEIVER.

This consists, in its simplest form, of two metallic disks about two inches in diameter, so mounted as not to be in metallic contact, and this is effected by turning a flange in a hard rubber case so they may be kept apart by it (see Fig. 4). A cap is screwed down upon each plate, one of them having a small hole in the middle of it to listen at; the other is a larger one, having a knob turned upon it for conveniently holding it in the hand. Through the middle of the knob a screw is sunk which touches the back plate and serves to adjust it to the best position relative to the front or vibrating plate. The back plate is thus fastened at both edge and middle, which prevents it from vibrating, while the front plate is only fast at its edge, leaving the middle free to vibrate. Each of these plates, A B, Fig. 3, is in metallic connection with the induction coil so as to be its terminals. When thus connected and one makes and breaks connection in the primary circuit a click may be heard by one holding the receiver near to the ear. If a Helmholtz interrupter be employed to make and break the primary circuit the pitch of the fork can easily be heard, and with a *Reiss transmitter* or other suitable one in the same place any kind of a sound will be reproduced.

The explanation of this is easily understood from the foregoing description of the conditions present. The electromotive force generated by induction in the coil changes the two terminals in the receiver, one positively, the other negatively; they therefore attract each other.

One of them is free to move, while the other is rigid. The middle of the freer plate consequently moves slightly toward the other whenever they are electrified, and *in so doing spends the energy of the electricity*, while its elasticity brings it back to its place. It is not essential, however, that both of these terminal plates should be connected to the induction coil, for if only one is connected the recurring charges will cause the free plate to vibrate, for a charged body will attract any other body, so if the connection be to the back plate it will attract the front one and make it move, and if the connection be to the front plate it will attract the back plate and approach it. The effect will be increased by putting the finger upon the terminal that is free; not because it *makes a ground*, as it is termed in electrical science, or completes an electrical circuit, for if the individual listening be as perfectly insulated as glass or hard rubber can make him, the sound is as loud as if he stood on the ground; but the individual becomes electrified by induction, it is the same as enlarging the terminal would be. Consequently receivers are made having only one wire terminal (see Fig. 9), the other plate being connected by a conductor to a metallic ring upon the knob, and this receiver is as efficient as the other.

Electricians will recognize in this structure what is technically known as the *air condenser*, and the mutual attraction of the two plates has been employed as a means of measuring electric potential. In this case one of the plates is suspended from one arm of a balance, while the other is fixed underneath it at a short distance. The attraction of the plates when they are electrified requires an extra weight to keep them apart, and the weight needed is the measure of the attractive force. But the plates will attract each other when glass or mica or any other non-conducting substance is placed between them in the place of the air; and one might expect that if such an air condenser would give sonorous results, other forms of condensers would do so likewise, and this is so. Indeed, whoever has charged a Leyden jar has probably noticed the sounds coming from it when it is nearly saturated. In 1863 Sir Wm. Thomson had his attention directed to the sounds produced by discharge in an air condenser.*

When the two plates of Epinus's condenser are in metallic contact no sounds whatever can be produced by it, but if they are separated by a thin film of air they will reproduce speech (see Fig. 6, at E). In the first case the electricity passes from one plate to the other without doing work or changing its form; while in the latter, its form is changed and work is done, and between the best conductors, such as silver and copper and the perfect non-conductor air, there are all degrees of conductibility, and whenever electricity spends its energy upon an imperfect conductor it results in heating it; that is, in molecular and atomic vibrations. Consequently an undulatory current from an ordinary transmitter, when sent through an imperfect conductor, will set up sound vibrations in it which may be appreciated by the ear. Let, then, any poor conductor, like a disk of carbon, a sheet of paper or of gelatine, or such chemical substances as ammonium chloride, be placed between the terminal plates, and an undulatory current sent through them will result in sound, and speech may be reproduced.

Now, the phenomena observed in Geissler's tubes and Crookes' tubes show that the residual gaseous molecules are violently impelled from the electrified terminals, not simply because they are electrified, but because they are heated, for the same phenomena are witnessed when the terminals are heated in other ways; so it is probable that between the plates of the air condenser there is an actual impulsion of the air particles from one to the other, and that the phenomenon of attraction is not isolated from molecular impact. Receivers have been made in which a vacuum could be produced between the plates, but no great difference could be observed in their performance; and when one reflects upon the immense number of molecules left in the best vacuum yet produced, it is not a matter for much surprise.

When a non-conductor, such as air, or vulcanite, or mica, separates the two plates, there is a complete transformation of the electricity at the limiting surfaces, and with small condensers the efficiency depends upon the electromotive force employed. For low electromotive forces, such as common batteries of a few cells can give, the effect is almost inappreciable, and for this reason such a receiver as this is quite free from the disturbance known as induction, and which is so troublesome in the magneto-telephone, such induced currents being generally of low electromotive force.

Among the earliest of my experiments, made while developing this method, was to attach one terminal wire from an induction coil to the outer coating of a Leyden jar, taking the other wire from the coil in one hand, and applying one ear to the knob of the jar. Every word spoken at the transmitter was distinctly heard, but the prickly sensation due to the electricity was too disagreeable. Another receiver, not less curious than the Leyden jar, was found in the pair of insulating handles made for the medical application of electricity (Fig. 8). When these were connected to the coil wires, and one held in each hand by the wooden part, while the metallic ends were placed at the ears, any kind of a sound at the transmitter was heard without any difficulty, but of course the same sensation was felt as with the jar. Many forms of condensers have been employed with capacities too small to measure up to two micro-farads, and these in all sorts of relations, charging the plates from batteries, from Holtz machines, charging the line as in cable works, etc., all of which give results that differ only in degree.

THE TRANSMITTER.

As with other systems in common use, there is a transmitter as well as a receiver. One form of the transmitter is shown in Fig. 10, it being attached to the door of a box containing battery and coil. This transmitter is substantially the same as the one invented by Reiss in 1861. His consisted of a cubical box (see Fig. 6) about five inches on a side, having an opening on one side to talk into, and another one on top, across which the diaphragm was fastened. A pin of platinum was glued to the middle of the membrane and connected by a wire to a binding screw. A V-shaped wire with platinum point touched upon the platinum of the membrane, and with its binding screw served to complete a galvanic circuit. This one (see Fig. 10) differs from this of Reiss only in making the chamber smaller, making the connecting wire on top I-shaped, and substituting carbon or other suitable substance for the platinum; but the platinum does very well. It is a matter of some surprise that the old transmitter is still spoken of as a *make and break* circuit, and that it can only transmit pitch, whereas, whether it breaks or not when a sound is made in it depends solely upon the intensity of that sound, just as with the Blake transmitter. If one talks gently to the original Reiss transmitter, it not only does not break, but it transmits speech with all its qualities.

Accompanying the transmitter an induction coil is shown at I, Fig. 6, and as the working of the receiver depends upon electromotive force and not upon current, it is necessary, if a coil be used to raise the electromotive force, to have one with many more turns than is needed with the magneto receiver, and the best results have been obtained with a coil having a resistance of four or five thousand ohms, but it is probable that this will be reduced.

On account of the high electromotive force a better insulation is needed than ordinary telegraph lines give when the induction coil is at the further end of the line, but if it is at the receiving end, and a low electromotive force is employed in the primary, then ordinary insulation will answer. Again, the electromotive force being high, inserted resistances do not so markedly decrease the efficiency of the instrument, as in the case with the magneto-telephone. For instance, the articulation is perfect and loud enough with a resistance of fifty thousand ohms, a resistance equal to five thousand miles of common telegraph wire, and it may be heard through a resistance of a million ohms, practically an infinite resistance.

If one of the terminals of a receiver be charged in any way, the reaction between the two plates will be stronger than it will be without. Let, then, one terminal be attached to a knob of a Holtz machine that is kept charged by rotation. The sounds will be heard much louder, and any other source of electricity with high potential will answer the same purpose. Hence a battery of a large number of cells may be substituted for the Holtz machine, and one of the terminals of the battery may go to the ground, though

* See papers on Electro Statics and Magnetism, page 236.

© 1881 SCIENTIFIC AMERICIAN, INC

this is not essential. This arrangement will keep the terminal plate charged to the potential due to the chemical relations and number of cells in the battery. If the battery be placed in the line wire it will keep both ends of the line charged. A Volta's pile may be substituted for the battery in either place, and so may a charged condenser of any capacity, the electrically charged terminals in this system acting in a way analogous to the permanent magnets in the magnetic system.

There are various other ways of employing condensers, and as one would infer from the preceding descriptions of the phenomena, these condensers will talk, that is, they will reproduce in sound the varying electrical conditions to which they may be subjected, as will also either a battery or a Volta's pile.

I have often heard them talk, and have made many experiments with such receivers.

Several other diagrams are also added, showing some of the various ways in which the system may be employed.

In perfecting this new telephone Professor Dolbear has given long and constant study to the scientific problems involved, while the mechanical construction has been prosecuted by Mr. H. C. Buck, aided by skilled machinists and competent assistants. The above concise description in the inventor's own words will give our readers a clear understanding of the principles that underlie his interesting invention, and it only remains for us to describe in brief the several figures in our front page engraving.

Fig. 1 shows the telephone in actual use, the transmitter being secured to the wall, the battery and induction coil being placed in a box on the floor, or in a convenient closet. Fig. 2 is a perspective view of the new receiver; Fig. 3 a face view of the same, with a portion of the casing broken away to show the connection of the two binding posts, A B, with the diaphragms, C D, and the adjusting screws by which the distance between the diaphragms is regulated are shown in the sectional view Fig. 4

Fig. 5 illustrates the principle of electrical attraction upon which the action of the new receiver is based; the electrostatic charge received by the plate, E, from the induction coil attracts the pith ball suspended in front of the plate.

Fig. 6 shows the two plates, E, of an Epinus condenser, placed near together and connected with the terminals of the secondary wire of the induction coil, I, and used as a telephone receiver.

Fig. 7 shows an induction coil with a separable primary for illustrating the principles of electrical induction.

Fig. 8 illustrates the manner of securing telephonic communication through ordinary medical electrodes.

Fig. 9 illustrates the essential features of the new telephonic system. I being the induction coil whose primary is in circuit with the battery, B, and transmitter, T, the receivers, R, are each connected with a single terminal of the secondary wire of the coil, I.

Figure 10 shows Professor Dolbear's experimental telephone transmitter. In this instrument the diaphragm, A, is horizontal, and carries a carbon electrode, upon which rests a movable carbon electrode connected by an arm with a delicately pivoted bar supported by the diaphragm cell. The local circuit is from the battery, B, through the carbon electrodes, and through the primary of the induction coil, I.

Fig. 11 shows the exhibit prepared for the Paris Electrical Exhibition, and intended to represent the perfected telephone system. It shows two similar instruments, which in practice are placed at opposite ends of the telephone line. T is the transmitter, B the battery, I the induction coil, R the receiver, and G the ground. *b* is a key for cutting out the receiver when it is desired to talk. *d e* are the primary wires, *f* the secondary wire leading to the key, *h* the line connection of the receiver, and *i* is the ground connection of the receiver.

MECHANICAL INVENTIONS.

Mr. Herman W. Vitt, of Union, Mo., has patented an improved device for communicating motion from the spindle to the stone, the construction being such as to allow the runner to run true, though the spindle may be out of tram or sprung.

Mr. Charles O. Dougherty, of Crisfield, Md., has patented an improved windlass for oyster dredges, by which, in case of accident or when it is desired to allow the dredge line to pay out rapidly, the machinery may be quickly thrown out of gear, and the spool on which the dredge line is wound be allowed to revolve freely on the shaft.

A new and improved machine for rolling axles, rivets, bolts, and other articles, has been patented by Mr. John H. Whitney, of New York city. The metal is fed into the machine through a suitable guide consisting of a loose flanged short tube held between two or more rollers or adjustable slides, the metal being held between the rollers by a pair of automatic tongs, which close as the work progresses.

An improvement in hoisting apparatus has been patented by Mr. John George Speidel, of Reading, Pa. The object of this invention is to provide for lifting variable loads, to insure safety, and to compass those objects by an apparatus of a portable nature. The invention consists in a block provided with differential gearing of novel arrangement, in safety-stop devices and automatic brake mechanism, acting by weight of load.

Mr. Charles K. Hamilton, of Lebanon, Ohio, has patented an improved air pump so constructed that it can be readily changed from exhaust pumps to condensing pumps.

How to Detect Carbonic Oxide in the Smallest Quantities.

One of the important sanitary problems is to detect in the air of our dwellings very small admixtures of carbonic oxide. The following test, furnished by Vogel, has long been regarded as the most simple and unfailing: To a flask of water exposed to the air under examination add blood very much diluted. Carbonic acid is shown by the immediate reddening of the mixture. The addition of ammonia sulphide does not banish the absorption lines in the spectroscope as with ordinary diluted blood. This test will show the presence of a portion as small as 0·25 of 1 per cent. Experiments show, however, that the oxide may not all be absorbed in this manner.

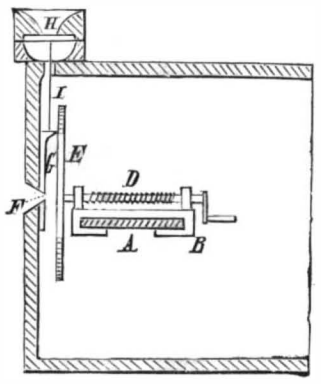
Dr. Walter Hempel uses the lungs of living mice to gather the gas from the room. The mouse experimented upon is then drowned, and blood from the region of the heart is tested with fresh, colorless ammonia sulphide. In this way 0·03 of 1 per cent can be easily detected, and strong symptoms of poisoning are shown with as little as 0·05 of 1 per cent of the gas. Since carbonic oxide is not, like carbonic acid, an unavoidable ingredient of the atmosphere, it becomes a matter of great importance to determine and prevent its presence.

PHOTOGRAPHING THE VIBRATIONS OF THE VOICE.

BY C. CUTTRISS.

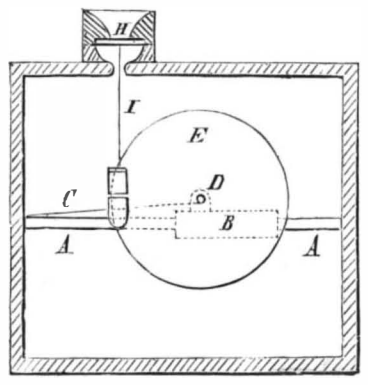
Reading of the experiments of Messrs. Bell and Tainter on the photophone, the idea struck me that the vibrations of the voice might be photographed. Not having the facilities to carry out the experiments, I communicated the idea, with a sketch, to my brother, Thomas Cuttriss, Leeds, who has carried it out as follows: A box, blacked inside, has a shelf, A, on which slides the saddle, B, which carries the

Fig. 1.



plate, E, and shaft, D, by which the plate is rotated. C is a silk thread fastened at one end to the shelf, the other being wrapped round the shaft, D, in that way, when the shaft is turned, traversing the plate in front of the slit, F, and the movable shutter, G. The shutter is connected to the diaphragm, H, by the wire, I, and is opened and closed

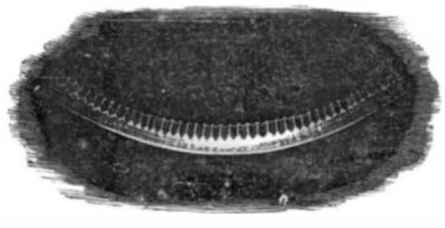
Fig. 2.



by the vibrations of the diaphragm. A powerful light is focused upon the slit (sunlight was used in our experiments), and the plate rotated as steadily as possible while speaking upon the diaphragm.

The plate, on being developed, showed a spiral, across which were dark lines showing on the outer circles the vibrations of the diaphragm very distinctly (see Fig. 3); but owing to the much slower speed of the plate, as it drew

Fig. 3.



nearer the center, the vibrations there merged into a dense fog, and were lost.

The vibrations are similar to the indents on the tinfoil of Edison's phonograph. We are now trying to reproduce the words by the action of light transmitted through the negative upon a gelatine film, using that in like manner to the tinfoil in the phonograph. The plate used was an ordinary wet negative.

SILK CULTURE IN AMERICA.

A prominent silk manufacturer remarked to the writer: "Were I to go into silk raising I would send my cocoons to France or Italy to be reeled."

The president of the Silk Association of America, at one of their meetings, when a Mr. Lowery, of Huntsville, Ala., addressed them on the subject of silk raising, asking aid and information, said he understood the difficulty of silk raising in this country commenced with the reeling; or, in other words, commenced after it was raised. This is the whole subject in a nutshell. We can raise silk in any quantity, but reeling is manufacturing requiring machinery and skill. It is worth three dollars per pound to reel silk from the cocoon, even and fine as required for our best organzin for warps. Our manufacturers now get the benefit of the labor of foreign factories duty free by calling this "raw silk." Let it be ever so slightly twisted and it is called thrown, and must pay a duty of thirty-five per cent. Our throwster is protected from the foreign throwster by a duty of thirty-five per cent; or a silk worth six dollars, two dollars and ten cents is added, making it cost eight dollars and ten cents. He gets the reeled "raw silk," on which has been expended three dollars in labor, for five dollars, the whole work of throwing into organzin, "the most costly of all threads," costs only one dollar and twenty-five cents, making seven dollars and twenty-five cents, against eight dollars and ten cents, to import, so creating a monopoly, for this price covers every expense—factory, machinery, and labor.

It is plain to see that unless the reeling from the cocoon in this country receives like protection with the spinning it can never be done here, and that simply means and explains why one manufacturer says he would, if he raised cocoons, send them to France or Italy to be reeled, and what may be understood by the observation of the president of the Silk Association of America—"the difficulty of silk raising in this country commenced with the reeling." Now, if this is a difficulty in the way of the throwster, then the throwster is a difficulty in the way of the weaver, and the weaver in the way of the consumer. But the consumer says, for reasons of indirect benefit, "I consent to this tax," and the greatest benefit accrues from the largest amount of profitable employment and the greatest saving of outlay to the country. By raising our own silk we should save an immense amount in wealth and more than double the labor in the production and reeling the silk, independent of raising the cocoon. The money value of reeling is three dollars per pound, against the average work on all threads "after reeling" not to exceed one dollar.

I present these facts for consideration. We now permit the throwster to do three-fourths of his legitimate work in foreign factories, bring it here to the exclusion of the most artistic and valuable branch of the silk manufacture, and certainly what would be one of our most valuable and interesting products.

No one who understands doubts our ability to raise silk. Our silkworms' eggs are now exported to improve the stock of older countries, where we have been taught to look for excellence. Then why do we not reel it? The strength, luster, and evenness of American silk are excelled by none, and it is far superior to many brands now imported.

LEWIS LEIGH.

New Haven, Ct.

Insectivorous Plants in Florida.

To the Editor of the Scientific American:

In your issue of May 28, Mr. Peter Henderson has a short article entitled "Insectivorous Plants," in which he demonstrates by experiment that the "Carolina fly-trap" (*Dionea muscicipula*) and the "cruel plant" (*Physianthus albens*) are not truly insectivorous, *i. e.*, do not depend upon insectivorous food for their nourishment and growth.

Now, in Florida we have several so-called insectivorous plants, which, for the past three or four years, I have examined and watched very carefully, and have arrived at precisely the same conclusion in regard to them as Mr. Henderson and Professor Tait have in regard to the above, viz., "that the so-called feeding of the plants in no way conduced to their health or vigor, being identical in all respects with those that had not received insects."

Among those the largest and most important is the "spotted pitcher plant" (*Sarracenia variolaris*), found growing abundantly along the edges of our swamps.

From this plant I have taken at different times hundreds of insects, alive or in a more or less state of decay, among which were numerous species of ants, centipedes, bugs (*Hempitera*), beetles (*Coleoptera*), etc

The inside of this "natural insect trap" is covered with fine, bristle-like hairs, which seem to be sensitive to touch, and woe to the unlucky insect that enters therein; for these hairs entwining it with a "siren's" embrace, the insect, after a few ineffectual attempts to reach the opening at the top of the leaf and thus escape, becomes exhausted, and at last, overpowered by the fumes and gases of the decaying, putrefying mass below, dies, drops to the bottom, and in a few hours becomes part and parcel of the same, and possibly an accomplice for the destruction of some near relative.

Attracted by this putrefying mass a flesh-fly (*Sarcophaga sarraceniæ*, Riley) drops an egg into it, and the larva which hatches therefrom takes up its abode, finding plenty to feast upon in the decaying insects.

When ready to pupate this larva invariably descends into the ground, either through the side of the leaf or the stem of the plant, changes into a *puparium*, and transforms within eight or ten days into the perfect fly.

Many of these plants do not contain this putrefying mass of dead insects, and I can see no difference between them and the others in growth or appearance, and I have since accepted many statements in regard to insectivorous plants, to use a Latin phrase, *cum grano salis*.

WM. H. ASHMEAD.

Jacksonville, Fla., May, 1881.

SHOOTING FINBACK WHALES.—Twenty finback whales were shot with bomb lances off Provincetown, Mass., May 14. The business of hunting these whales has lately become an important industry at that place.

© 1881 SCIENTIFIC AMERICIAN, INC

ENGINEERING INVENTIONS.

Mr. Charles H. Kuhne, of Butler, Pa., has patented an apparatus for regulating the supply of water to steam boilers, by which the water is prevented from falling too low and rising too high in the boiler, thereby avoiding the danger and damage incurred by an excess or scarcity of water. The invention consists in a chamber connected with the boiler, and containing a float that moves a steam cock, combined with a feed water chamber, and a steam cylinder containing a piston, connected with the valve in the water chamber in such manner that the rise and fall of the float permits or cuts off the flow of water to the boiler as required.

Mr. Horace Harding, of Tuscaloosa, Ala., has patented an automatic lock that is adapted for use not only upon canals, but also upon rivers, where wide gates are required for passing tows, rafts, and large vessels, and where, in case of submergence from freshets, it is desirable that there shall be no levers or other lock fixtures exposed above the walls to damage from drift or floating ice.

Mr. Charles W. Rich, of Whitehall, N. Y., has patented a vibrating propeller. The object of this invention is to facilitate the application of steam power to canal boats and other vessels, and to adapt the propelling apparatus for use in deep water and in shallow water.

An improvement in gas engines has been patented by Mr. Charles J. B. Gaume, of Brooklyn, N. Y. The object of this invention is to simplify the construction of gas engines, and to utilize the power produced by the explosion of the mixture of gas and air to greater advantage.

In the ordinary process of tanning leather the hides are thrown into the vats that contain the tanning liquor, and as the stronger and sour liquor in the vat settles to the bottom the hides have frequently to be handled and moved about, that they may all of them, and all parts of them, be equally exposed to the action of the liquor. Mr. Charles Flohr, of Canisteo, N. Y., has patented a combined tan vat and stirrer, the object of which is to avoid the labor and cost of this customary handling of the hides, and to agitate the liquor and expose the hide to the action thereof in such a manner that the tanning process shall be more speedy and the hides more evenly tanned.

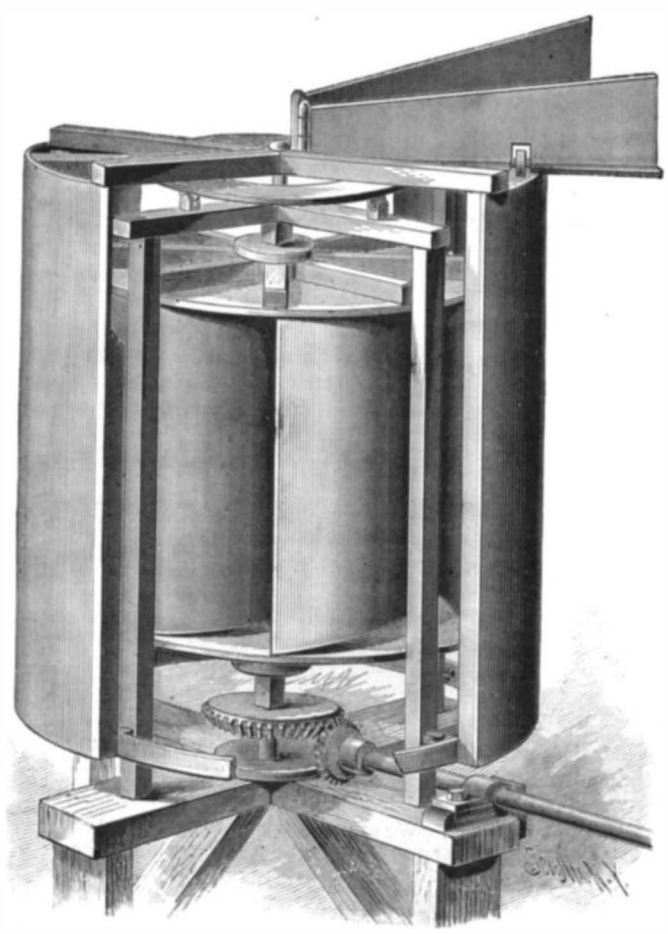
IMPROVED WIND MOTOR.

We give an engraving of an improved wind motor, lately patented by Manuel de la Torre, of the City of Mexico, Mexico. It consists of a wheel provided with curved vanes rotating on a vertical axis in a cylindrical hood, which is closed on two opposite sides and opened on two intervening sides, so that the wind entering the wheel at one side escapes at the other side. The frame is revolved or adjusted to the wind by two vanes fixed on its top, one of which is adjustable and may be moved to regulate the supply of wind to the wheel.

The supporting frame of the device consists of a base, upright post, and horizontal cross pieces, which unite above the center of the base. The vertical shaft turns in a step at the bottom, and is journaled at its upper end in the cross pieces of the main frame.

The turbine wheel is composed of two similar disks secured to the shaft at a suitable distance apart to receive between them four curved vanes. The inner edge of each of these vanes is fixed on a point about half way between the center and circumference of the two disks, and its outer edge reaches to the circumference of the disks. The cylindrical hood, closed on opposite sides by curved quadrantal plates, is supported on a vertical pivot, that is fixed centrally in a step on top of the cross pieces or timbers of the main frame, and it is also supported by means of anti-friction rolls, which run on an annular track attached to the under surface of the top of the cylindrical frame. On the top of the cylindrical hood there are two horizontal vanes, one of which is fixed and the other stationary, while the latter is laterally movable through a quarter of a circle. These vanes, under the influence of the wind, control the movement or adjustment of the cylindrical hood, turning the frame so that the wind is admitted at one side of the wheel and escapes at the opposite side in a greater or lesser degree, according to the pressure or force of the wind.

The cylindrical hood is held perpendicularly and revolves easily on anti-friction rolls fixed on the top of its cross pieces of the main frame, and projecting up against a circular track under the top of the cylindrical frame. Rolls that project laterally from the lower part of the uprights against a ring on the inner surface of the cylindrical frame near the bottom support it against lateral pressure. This motor is compact and effective, and is not so liable to damage from storms as windmills of the usual pattern. M. De la Torre, the inventor and patentee, is for the present at the Continental Hotel, Broadway and 21st street, New York city.



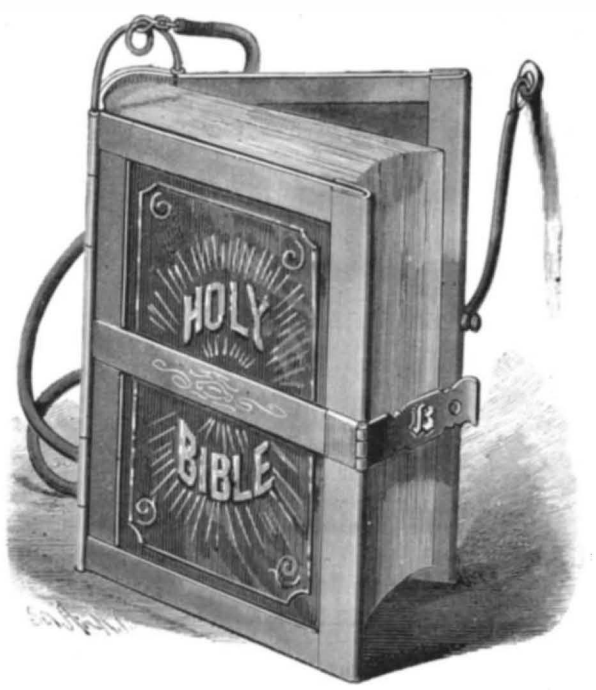
DE LA TORRE'S TURBINE WIND MOTOR.

Growth of Timber.

As the result of observation, and from the testimony of reliable men, the following is about the average growth in twelve years of the leading desirable varieties to timber, when planted in belts or groves and cultivated: White maple, one foot in diameter and 30 feet high; ash, leaf maple or box elder, one foot in diameter and 20 feet high; white willow, one and a half feet in diameter and 50 feet high; yellow willow, one and a half feet in diameter and 35 feet high; Lombardy poplar, 10 inches in diameter and 40 feet high; blue and white ash, 10 inches in diameter and 25 feet high; black walnut and butternut, 10 inches in diameter and 20 feet high.

NEW BOOK PROTECTOR.

The device shown in the engraving is designed for the protection of books that are continually subjected to wear, and also to prevent valuable books from becoming lost, by attaching the protector by a chain to a desk, pew, or other permanent object.



BRUMM'S BOOK PROTECTOR

The case or frame inclosing the cover of the book is made of sheet metal, and attached to a curved sheet metal back by hinges. The edge strips of the frame are folded over the edges of the book cover, and are provided with a clasp in front. A short wire loop attached to the back receives the chain by which the book is secured. This chain is covered with leather or other flexible material to render it smooth and easy to handle, and prevents rattling.

The light open frame inclosing the book does not add materially to the weight of the book, while it protects it from wear and injury.

This device was lately patented by Mr. George W. Brumm, of Boise City, Idaho Ter.

IMPROVED STARCH POLISH.—Spermaceti, 1 part; gum arabic, 1 part; borax, 1 part; glycerine, 2½ parts; water, 21½ parts; and a sufficient quantity of perfumed alcohol to produce an emulsion. About three teaspoonfuls of this emulsion are required for about one-quarter of a pound of starch.

MISCELLANEOUS INVENTIONS.

Mr. Howard Newlin, of Brooklyn, N. Y., has patented a machine for treating street refuse or sweepings, or for the separation therefrom of materials having value. The machine is also adapted for use in separating garbage and ashes, coal and coal dust, and the cleaning and separation of coffee, rice, and other grains. It consists in a combination of endless traveling belts, screens, blowers, and washing tanks, forming the complete machine, whereby the material is separated and washed, and further separated by specific gravity, if required; also, in separating screens and water tanks of novel construction.

An improved fish-plate for use on railroads, whereby the ends of the rails will be securely held and the transverse strain upon the holding bolts entirely avoided, has been patented by Mr. George H. Waring, of Indiantown, New Brunswick, Canada. The invention consists of a fish-plate having around its bolt holes projecting thimbles or bosses, whose length is equal to half the thickness of a rail web, so that when two plates are applied to opposite sides of a rail the thimbles entering the corresponding holes in the web will meet in the center.

Mr. Isaac W. Norcross, of Red River Iron Works, Ky., has patented an improvement in lumber booms designed to catch and retain logs that are drifted down by the current of the river. The improvement embodies a drift sheer, which is in the nature of a series of logs converging toward each other, to gather the timber and the commingled drift, ice, *debris*, etc., combined with a shore section having a series of side gaps and a trail boom floating nearly parallel with the shore section, which holds the logs and drift as they pass from the drift sheer close to the side gap; where they are assorted from the drifts and safely placed inside the shore section, which is divided into a series of pockets by shore fastenings with outriggers, so as to avoid the cumulative strain of the whole lot of timber by distributing the timber in lots in the several pockets, and thus avoiding the breaking of the boom and loss of logs, which is liable to occur when the cumulative strain of a great number of logs is brought to bear against the boom.

An improved toe weight, to be attached to horses' hoofs, which is so constructed to fit any style of horseshoe and does not injure the hoof, has been patented by Mr. Charles Drew, of St. Louis, Mo. The invention consists of a weight provided with a longitudinal threaded perforation which receives a threaded pin that is clamped to the horseshoe by means of clips catching in opposite edges of the shoe and held together by a screw.

An improvement in snap hooks has been patented by Mr. Edward Davidson, of West Dedham, Mass. The invention consists in making a snap hook with the loop on the same side as the hook, folding the end of the strap within it and securing said strap by a screw.

An improved fruit drier has been patented by Mr. George S. Grier, of Milford, Del. The invention relates to improvements upon the fruit drier patented by the same inventor, October 28, 1879, in which a vertical series of trays were used, each of which was supported upon pawls attached to four vertically-sliding posts, and the whole raised or lowered and sustained one above the other, while heated air passes up through the open bottom of the same.

Mr. Martin A. Howell, Jr., of Chicago, Ill., has patented an improved wire stretcher for either plain or barbed wire, whereby one person with an ordinary lever or wooden handspike is enabled to draw to its proper position any barbed or plain wire, all injury and danger of breakage from kinks, short bends, curls, or abrasions of the wire being avoided.

Mr. Frank W. Mix, of Terryville, Conn., has patented an indicator padlock, in which a change is made in the indicator wheel, and a different set of symbols, figures, or letters made to show through openings in the case, for the purpose of enabling the proper authorities to detect any surreptitious opening of the lock.

Heretofore the machines for making felted yarns have been constructed with a taut cloth or linen sheet, upon which the yarns were felted, but it was impossible to give this sheet the desired tension. The operation was very inconvenient and the yarns were stretched, thereby separating the filaments, which is just the reverse of that which is to be obtained by felting the yarns. Mr. Louis Bourau, of Paris, France, has patented a yarn-felting machine which is simple in construction, will felt the yarns without tension, and complete the felting in a single operation.

An automatic device for centering the blocks from which bobbins and quills are formed, has been patented by Mr. Jerome B. Fellows, of Fryeburg, Me. The invention consists of forked block supporting posts actuated by suitable mechanism to present the block to the lathe centers, and then fall out of the way to permit the turning of the block.

An improved gauge for bracelets has been patented by Mr. Willis H. Howes, of New York city, The object of this invention is to readily ascertain the exact size and form of bracelet required to fit any particular wrist. The invention consists in a gauge for bracelets that can be readily contracted and expanded to fit a wrist, and thus give the exact form and size of bracelet required to fit the wrist.

Mr. Anthony St. Mary, of Decatur, Ill., has patented a trap intended to facilitate catching hogs and other animals and holding them while being ringed or marked.

© 1881 SCIENTIFIC AMERICIAN, INC

The House Wren as an Insect Destroyer.

The observations I have been able to make during a residence of several years on a farm, have convinced me that the common house wren is really one of our most valuable birds, not, perhaps, for what they have done, but from the possibilities wrapped up in their diminutive bodies. They are quite as social as the purple martin or blue bird, and greatly surpass both of these in the rapidity with which they increase. I began several years ago to provide them with resting places in the vicinity of my buildings. Sometimes I fastened the skull of a horse or ox, or a small box, in a tree top. But latterly I have made it a practice every spring to obtain thirty or forty cigar boxes for this purpose. If the box is long and large, I put a partition across the middle and make a hole through into each apartment. It is very seldom that these boxes are not occupied by one of these little families. In most instances two broods are annually reared in each nesting place. One of my boxes last season turned out three broods of young wrens—six little hungry birds each time, or eighteen in all! I think a cigar box never before did better duty. The lamented Robert Kennicott stated that a single pair of wrens carried to their young about a thousand insects in a single day! Like all young, rapidly growing birds, they are known to be most voracious eaters, living entirely upon insects. The point upon which most stress may be laid is this: That by providing them with nesting places, in our gardens, orchards, or grounds, and not allowing them to be caught by cats or scared away by mischievous boys, we may have scores if not hundreds of them about during most of the time in which insects are destructive. They undoubtedly return to the same localities to rear their young year after year. Last season I had up about thirty of these nesting boxes, and all but two or three, which were not favorably located, were occupied. My crop of wrens could scarcely have been less than one hundred and fifty, and the old birds filled the air with music when they were not on duty in building their nests or feeding their young. The coming spring I intend to put up at least a hundred of these nesting boxes in my orchards and groves, and I have no doubt I shall be repaid a hundred thousand fold for the little labor it costs. As long as they come back so regularly every year and in constantly increasing numbers, and serve me so well, I shall do all in my power to protect and encourage them. And I am of the opinion that when one species of social, useful birds can be made to congregate in such unusual numbers, others will come also. But the hardiness, sociability, love of the locality where it was reared, and wonderful fecundity of the little house wren, render it, in my judgment, one of the most valuable of all our insectivorous birds.—*Charles Aldrich, in the American Naturalist.*

THE LUMP FISH.

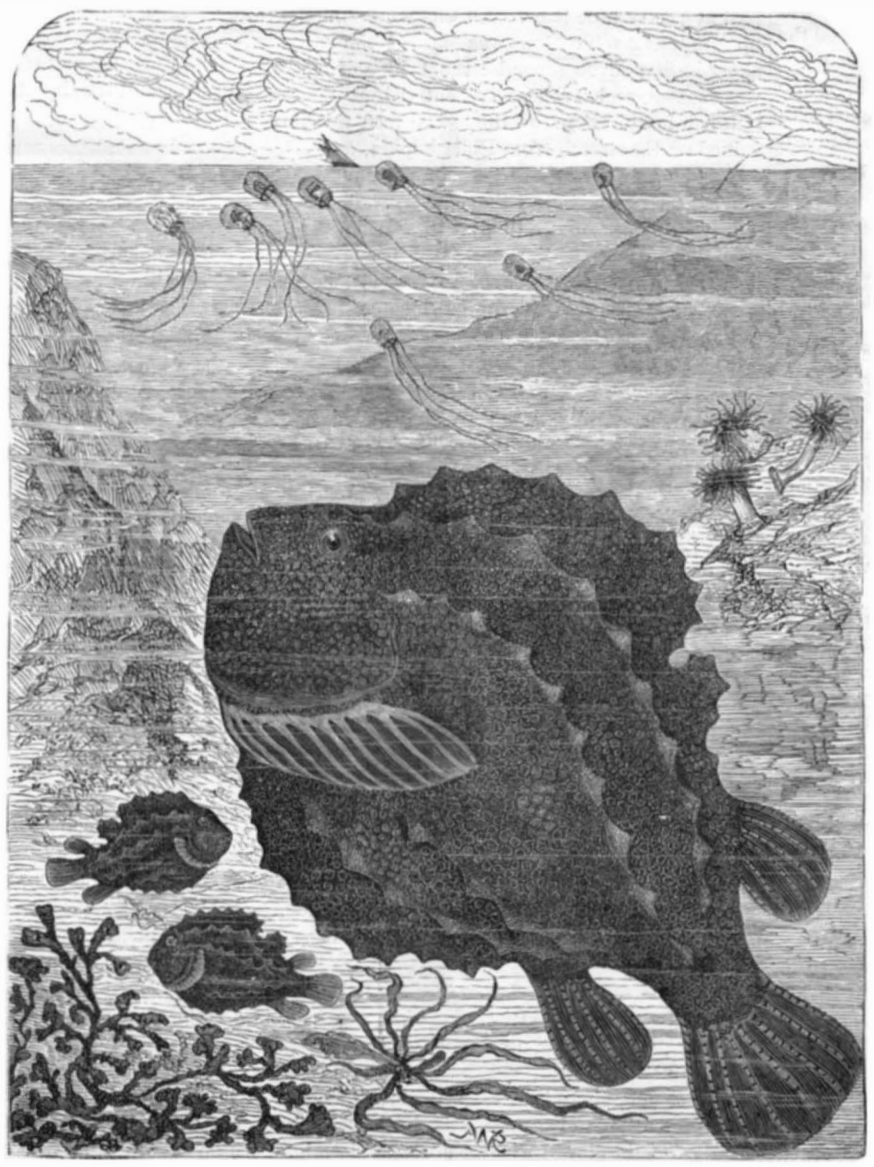
Family Cyclopteridæ, a small family, characterized by the ventrals being united into a disk or cup-shaped form. Body smooth and without scales. Eyes placed on each side of the head. The two dorsal fins are so much enveloped in a tuberculous skin as to appear like a hump on the back. Body deep and rough, with bony tubercles.

The shape of the lump fish is suborbicular in outline, compressed towards the dorsal ridge. The body of the fish is soft and flaccid, resembling a lump of jelly. Instead of scales, the body is covered with minute bony tubercles. From the anterior portion of the dorsal ridge, the outline slopes in a concave line to the orbits, where it becomes abruptly declivous to the snout. The space between the orbital ridges, flat. On the top or ridge of the back is a series of large compressed tubercles, and a smaller row on the anterior slope. Other series of tubercles are distributed over the body. The eyes are prominent. The nostrils double, mouth moderately large and broad, the under jaw slightly longest, small blunt teeth, in three or four rows, in front of each jaw; teeth also on the pharyngeals, and a small patch on the base of the tongue, which appeared to be distinct from the pharyngeals.

The dorsal hump, without any vestige of rays, ventrals immediately under the pectorals united into a disk, with a funnel-shaped cavity in the middle; the margins softly dentated. The skin of the lump fish is very thick, the stomach enormously large, intestines very long. No air bladder.

The range of the lump fish is from the polar regions to Cape Hatteras. A spinous variety inhabits the coast of Greenland and the Bay of Fundy. On the Long Island coast the lump fish is called the indigo bag, from the fact of its being of an indigo blue in color. On the Scotch coast it is called the cock-paddle and hen-paddle. In England it is known as the lump sucker and sea owl. On the French coast *licorne de mer*, where it is considered a great delicacy, and is known as a valuable market fish.

The little jelly fishes shown in the illustration as floating near the surface of the water, are known as sarsia, while its hydroid is called coryne. The sarsia is about the size of a small walnut, with a wide circular opening, through which passes the long proboscis, hanging from the under surface of the disk to a considerable distance below its margin. The four tentacles are of an immense length when compared to the size of the animal.



THE LUMP FISH.—(*Cyclopterus lumpus.*)

AMPHORA OF BRONZE AND WHITE METAL.

We give an engraving of a fine amphora of French manufacture, classical in design and highly wrought. The body

AMPHORA OF BRONZE AND WHITE METAL.

is of bronze, and the medallions and a portion of the ornaments are composed of white metal, giving a rich and striking contrast. It is mostly handwork, and is a truly artistic piece of metal work.

Recent Facts about Smallpox.

An interesting illustration of the value of revaccination is afforded by a report just furnished, at the instance of the Local Government Board of London, by the chief medical officer of the General Post Office. This report relates to an average number of 10,504 persons permanently employed in the postal service in London, all of whom have been required to undergo revaccination on admission to the service, unless that operation had been performed within seven years previously. Among these persons during the ten years 1870–1879 there has not been a single fatal case of smallpox, and in only ten instances have there been non-fatal attacks, all of which were of a very slight character. In the telegraph department, where the enforcement of revaccination has not been carried out with quite the same completeness, twelve cases have occurred in the same period among a staff averaging 1,458 in number. Eight of these attacks were of persons who had not been revaccinated, and one proved fatal. The remaining four were of revaccinated persons, who all perfectly recovered without pitting. This experience, like that of the nurses at the smallpox hospitals, seems to show that revaccinated persons enjoy absolute immunity from severe attacks of smallpox, and that their risk of catching that disease at all, even in its most modified form, is infinitesimal.

Heath's Discoveries in South America.

PROF. JOHN D. PARKER, KANSAS CITY, MO.

Since the death of Prof. Orton in South America, his assistant, Dr. Ivon D. Heath, and his brother, Dr. E. R. Heath, have both taken a deep interest in completing the unfinished work of that expedition. Prof. Orton had formed the purpose of conducting his expedition through the unexplored portion of the Beni River, over which there has always hung such an uncertainty and superstitious fear. But just before he reached this portion of his journey, the soldiers, whom he had hired and paid in advance for his whole expedition, intimidated by superstitious fear, suddenly presented their bayonets at the breast of Prof. Orton, refused to go any further, and returned home. Prof. Orton was, therefore, compelled to abandon his expedition, and returned almost heart-broken to die of weariness and disappointment on the legendary lake of Titicaca.

About three years ago, Dr. E. R. Heath returned to South America to complete, if possible, Prof. Orton's work, and explore this unknown region, the *terra incognita* of South America. It was hoped that some geographical society would aid in this important work, but while plans were being laid to secure material assistance, Dr. E. R. Heath undertook and solved the problem himself.

On December 28, 1880, Dr. Heath, of Wyandotte, Kansas, received a letter hastily written by his brother, dated Reyes, Bolivia, on the river Beni, Aug. 3, 1880, on the day of his embarkation for the rubber camps and the unknown country further below. He wrote that he was just setting out to explore this unknown region, and that three months would tell the tale of his success or defeat.

On March 19, Dr. Ivon D. Heath received another letter from his brother in South America, announcing that his expedition had proved a complete success. The following extract will be interesting from this letter, which is dated Reyes, Bolivia, Dec. 20, 1880:

"The question of the Beni is solved. This work of Prof. Orton is finished. I made the trip from Cabinas (rubber camps on the Madidi) in a canoe with two Indians. I left Cabinas September 27, and, after delays from sickness of my men, at 8 A. M., October 8, discovered a new river entering from the south, and at mid-day of the 8th arrived at the junction of the Madre de Dios with the Beni. No other white man has ever seen the mouth of this magnificent river. Crude measurements gave 735 feet for the width of the Beni, and 2,350 for that of the Madre de Dios. Took careful observations for latitude and longitude. At 6:50 A.M. of the 9th I passed the mouth of a river the size of the Yacuma, entering from the north, to which I gave the name Orton.

"At night we slept on a sand bar joined to a large island. On the 10th we passed this island, and at 8 A.M. another large one, and at 10 A.M. came to a line of rocks obstructing the river and making rapids. One mile further down we came to the main fall, which exhibits a perpendicular descent of the entire river of thirty feet. We occupied the remainder of the 10th in drawing our little craft over the rocks to the waters below. With much risk we passed the waves below the falls and camped. On the morning of October 11 we passed some rocks in the river corresponding to the rapids of the Palo Grande of the river Mamoré, but which, here, offer no serious obstructions to navigation. At 10 A.M., October 11, 1880, we arrived at the mouth of the Beni—that is, at the junction of the Beni and Mamore rivers. From thence we ascended the Mamore, 300 miles, to Exaltacion and Santa Ana, and from Santa Ana to this place, 200 miles west over the pampas; brought my boat on an ox cart.

"Here I am safe and sound, with a map of the three rivers—Beni, Mamoré, and Yacuma. From the river Madidi to the mouth of the Beni there are but four families of Pacavara Indians in the place of 'multitudes of man-eating savages,' as every man, woman, and child in Bolivia has believed during many scores of years. Rubber gatherers are already

© 1881 SCIENTIFIC AMERICIAN, INC

taking advantage of my exploration, and have established camps further down the Beni."

On account of superstitious fear of the unexplored portion of the river Beni, the productions of the rubber camps on the river Madidi have ascended the river Beni, 200 miles to Reyes, thence east 200 miles to river Mamoré, thence 300 miles north to its union with the Beni—700 miles around, in place of less than 300 miles direct. The waters of the Beni come down from the gold mines of Bolivia and through forests of cinchona trees; and the Madre de Dios from a much larger area of similar territory of Peru.

Dr. Heath, alone, unaided, spent two years in patient, determined preparation near the scene of the proposed exploration, and then, in a frail canoe, with only two Indian servants, with certain death before them, as all Bolivia believed, paddled bravely forth to explore a great river and extensive country where, during 350 years, a score of costly expeditions have disastrously failed. It is thought that the governments of Peru and Bolivia will give official recognition of his daring and successful achievement. His work will develop and change the commerce of many hundred miles of mountain and plain. Rubber and bark will now descend the Beni, instead of going 600 or 700 miles around. What risk and danger he faced in descending an absolutely unknown river, larger than the Mississippi, in which were rapids and falls! What satisfaction he must have felt when his canoe entered the yellow waters of the Mamoré, having successfully braved the superstition of ages and opened up a new country to commerce!

Dr. Heath has achieved a noble work in exploring this unknown region, which will be recognized everywhere, and as long as the Orton river flows, men will remember the explorer whose name it bears, who contributed so much to our knowledge of South America, and gave up his life to the cause of science.—*Kansas Review.*

Making Cushions.

The following is given in answer to a number of questions asked us by a correspondent on the method of making cushions, and may be of benefit to others of the craft.

Lay off the bottom in blocks, but in doing this, consider the flare of seat, so as to have the side and back blocks somewhere near the size of the middle ones. When this is done and the facings are shaped out, lay the facings to the bottom, and draw the bottom lines across them, and when the bottom is sewed to the facing, these lines must come together. You must cut your facings a little smaller than the bottom, and cut the bottom a little larger than the seat board. This will prevent you from drawing the bottom when sewing to facing. Next, make a frame out of five-eighth inch poplar, one and a half inch wide, and have the frame a little larger than the cushion top. Draw unbleached muslin over the frame, and paste another piece over this. When dry, draw a red line for the front part of the cushion; lay the bottom within one-quarter inch of the line. Mark at each tuft line, and whatever the flare is, allow three-eighths inch on the sides and back. When this is done, take the bottom off and draw the tuft lines on the frame. Take small bench awl and put through the tuft marks and draw across over the hole on the other side. This will show you where the tufts are to go.

Next lay the cloth off; there are several ways of doing this, but we will speak of two only. Lay cloth on bench with nap toward you, give each block five-eighths inch fullness lengthwise and one-half inch crosswise. Allow plenty of stuff around the edges, say one and one-quarter inch, punch a small hole for the tuft, and crease with a hot iron on the wrong side along the chalk lines. If the cloth is heavy, it will not require lining, but paste a small muslin stay under the tuft. Lay a layer of thick wadding over the cloth, put a little paste on each tuft, but none on the edges.

Next lay hair on the frame, a thin layer at a time, and do not press it, but let it lie loose, about four or five inches high. Lay the cloth over this, and tack with needle and thread at each tuft line. When this is done, take cushion needle and thread and tuft the cloth down, making each one single, and drawing down close to the muslin on the frame. Now take small round awl or tufting needle and work the blocks in shape. It is not necessary to be particular with this part, nor have them stuffed too full. Do this when the bottom is stuffed.

Sew down the edges with a back stitch, and draw the cloth tight; that is, do not have too much fullness, or the top, after it has been sewed to the facing, will look bad around the edges. Sew close to the lines on the frame, and wherever there is a weak place, push a little hair under it. Paste the muslin over the cord, and when dry trim off to suit one and one-eighth inch cover, basting the cord to bottom of facing and the fall to this, and then sew the bottom in.

Now turn and beat the corners out, also along the front. Turn it again and baste cord to top of facing. Be particular to have the nap of cord cover to run the same as the cloth on the front. Cut the top from frame, allowing one-quarter inch, and tack it with thread to the tuft line at the corners. If there is too much fullness at the corners, you must work it out. Leave the mouth open from the corner tuft line at the back, turn the cushion and cord at the corners, and also along the back; tack out, and fill the front corners with cotton; then sew the mouth up to within twelve inches.

Stuff the bottom up firm, being careful to keep the stuffing to the front, and when you think the bottom is well filled, feel along the front, and if the stuffing has worked away, run the stick along and work it to the front. When this is right tack the mouth to the cord with thread at the tuft lines, and draw the tufts in regular, commencing with the front row, and then sew the mouth up. Leaving the mouth open until the tufts are in keeps the strain from the cloth, and you have a chance to fill in more hair if necessary.

We will now give another way of cushion tops. Work the bottom, facings, and cord the same as the way explained above, and the frame also, as the difference is only in laying off the cloth, a less quantity of hair being laid on the frame. Take the cloth and spread it out on the bench with the face side up, the nap toward you. The bottom is laid off for tufts; lay this on the cloth, with one of the lines on the crease in cloth, allowing one inch fullness on the front. The French chalk and mark at each line from the bottom. Allow the same fullness around the edges as in the former. Take the bottom off, and draw the lines on the cloth. Thread and shuttle bobbin with "C" or "D" silk (Singer), using the same on top; fold the cloth to the chalk line, the long ones first, and stitch close to the edge. After the three long lines have been stitched, do the cross lines in the same way. Do not have the silk break in between the tufts; if there is a knot in the silk rip out the tuft. After stitching, flatten down at the tufts. Now work up this top the same as the one explained above.

This makes a pretty top, but if you do not wish to stitch it, take one-sixteenth inch fullness from between tufts, and leave the top plain; but in each case work the top the same. If you stitch the cushion top, do not back the same; if you pleat the top, pleat the back the same.—*Carriage Monthly.*

Seventy Miles an Hour.

The Philadelphia *Record* of May 12, gives the following account of a run from Philadelphia to Jersey City by a Pennsylvania train drawn by locomotive No. 10.

The train from Washington was fifteen minutes behind time in reaching the West Philadelphia depot, where the big, new locomotive adoringly named by rail-roaders "long-legged 10," was snorting under an enormous steam pressure. The Washington section was soon added to the other cars and a string of seven cars started out of the depot on a gentle roll. As the last car swung around the Zoological Garden the speed had increased to twenty miles an hour, and as the wheels turned to cross the northern end of the city the mile-posts commenced to pass at the rate of one in two minutes. When Frankford was reached the trees and fence posts seemed to skip back with increased speed, and the register showed forty-five miles an hour. Then the engineer, patting his pet on the throttle let loose his hold and the big thing started out to make up for lost time. Schenck's Station was passed at the rate of sixty-five miles an hour, but so easy was the riding that none of the 400 passengers knew they were shooting over the ground at the pace of more than one hundred feet a second. As Bristol was sighted the train slowed up with a series of jerks, and passed the station at what seemed to the passengers to be a lazy swing, but which was, in fact, a speed of forty-five miles an hour. For a few minutes there was no perceptible change in the rate, except perhaps that a gentle pull showed the locomotive was improving its time. Tullytown whizzed past at a sixty mile pace. All this while the traveling was up grade. As Trenton was sighted the mile-posts came along in fifty-seven seconds; the bridge over the Delaware was crossed, and Trenton was entered at the rate of forty miles an hour. Four of the lost fifteen minutes had been gained on the stretch from Philadelphia, and after a stop of two and a half minutes to take in passengers the big thing moved off again across the country. It was now a difficult task to pass from mile post to post in less than eighty seconds. After the third mile had been reached the time between posts fell to seventy seconds. Lawrence was passed at a sixty mile gait, and Princeton Junction followed at the same pace. Then the speed increased to sixty-five miles an hour until Monmouth Junction was reached. Here the big engine was slowed down to fifty-five miles while taking up water from a track tank; then twelve miles were gone over in twelve minutes. Down grades now helped to accelerate the impetus of the huge mass, and the mile posts before reaching New Brunswick flew by in fifty-five seconds. At New Brunswick quite a crowd was gathered at the depot to see the monster engine whizz through the city at the rate of forty miles an hour. Menlo Park danced by with a sunlight flash from the row of glass globes covering the electric lamps that line the track, and within the next five minutes the speed of the train increased on a straightaway dash to seventy miles an hour. Rahway, Newark, and the Meadows were skimmed over, and the immense train dashed into the depot on time, having covered eighty nine miles in ninety-five minutes, being an average of fifty-six and a quarter miles per hour for the entire distance, stops inclusive.

Iridium.

Last week we gave a brief notice of the new process of Mr. John Holland, of Cincinnati, Ohio, for fusing and moulding iridium. The following additional particulars we take from the specification of the patent therefor, granted May 10, 1881:

Iridium is rarely found pure, and only in dust and very small grains or scales. By reason of its non fusibility by the ordinary processes it is practically useless, except for pointing gold pens, and as found there is but a small proportion of it large enough to be used with advantage for even this purpose. I have also used it in its natural state, and, as usually found, alloyed with osmium (iridosmium, which is much softer than pure iridium), for pointing my fountain pens, and have experienced much difficulty in obtaining grains or scales large enough for this purpose, and many of these were imperfect, having cracks or fissures in them that rendered them worthless for drilled fountain pen points. The pieces as obtained are also of irregular shape. A large portion of the metal must, therefore, be wasted, as the dust which results from grinding the grains to the proper shape was of little use.

By my present invention I am enabled to fuse the dust as found in its natural state, whether pure or combined with other metals, into a molten mass, and mould the metal into ingots of any desired shape or size. I accomplish this result by the following process: The metal (preferably the dust, which, being of little use in the arts, is comparatively inexpensive) is put into a sand crucible and subjected to a high heat in an ordinary furnace. When it has attained a high temperature I add to the metal about one-fourth its weight of phosphorus. After the addition of the phosphorus the metal quickly fuses, when it may be poured into moulds of any shape or size. I find it best to have the moulds highly heated, as the metal chills and sets quickly. So soon as the metal is set I place it in a crucible with chalk or lime, return it into the furnace, and again subject it to a high heat. This eliminates the phosphorus, leaving the metal pure, hard, and non-fusible, as in its natural state.

I prepare the metal for my fountain pen points by casting it upon a flat metal plate, the surface of which is crossed by fine ribs, resembling lattice or net work. I pour the molten metal on this plate, filling the interstices between, and covering the ribs. The metal is thus cast in a thin sheet or plate having one of its faces grooved the reverse of the ribs upon the mould. Through these grooves the plate is broken into small cubes the proper size to be drilled and formed into fountain pen points. The same plan may be adopted with advantage in preparing journal bearings for watches to be used in place of the jewels now commonly used.

For pointing my gold pens I mould the metal into the form of wire or small rods. These I break into pieces of a size to make strong substantial nibs. The metal may also be cut by using a copper wheel or disk and diamond dust.

As the metal is exceedingly hard, non-fusible, practically non-corrosive, and capable of receiving a high polish, it will now be seen that I have discovered a mode of working it, supplying a great need long felt in many branches of the arts.

The metal is made much tougher by eliminating the phosphorus, but it may be used for many purposes without so doing.

Agricultural Notes.

SUNFLOWERS.

One of the best products in a small way is the sunflower. They occupy but little room, and are to most persons ornamental. They may be sown at any time after the 10th of May. The mammoth Russian is the largest and most productive variety. A single flower will produce a large quantity of seed. Although it well repays care it may be grown along fences, where other plants are not easily cultivated. Leave one stalk on a hill. The seeds are excellent for stock as well as for poultry, the leaves may be fed green to cattle, and the dry stalks will serve to light the kitchen fire.

RADISHES.

Radishes must be grown quickly or they will be tough, stringy, and bitter. If forced by a daily sprinkling of liquid manure they will be very brittle and tender.

STRAWBERRIES.

"S. R." says in the New York *Herald:* Set the plants in rows three and a half feet apart, with eighteen inches between the plants. Do not let them get too thick, but it is better to let them mat than to trim them. It is better not to pick the Wilson strawberry too soon. It will hang for several days after turning red.

The Utilization of Worn Out Horses.

The utilization of horses not fit to eat and too old to be of working service, in France, is said to be as follows:

It is first shorn of its hair, which serves to stuff cushions and saddles; then it is slaughtered and skinned; the hoofs serve to make combs. Next the carcass is placed in a cylinder and cooked by steam at a pressure of three atmospheres; a cock is opened, which allows the steam to be run off; then the remains are cut up, the leg bones are sold to make knife handles, etc., and the coarser, the ribs, the head, etc., are converted into animal black and glue. The first are calcined in cylinders, and the vapors when condensed form the chief source of carbonate of ammonia, which constitutes the base of nearly all ammoniacal salts. There is an animal oil yielded which makes a capital insecticide and a vermifuge. To make glue the bones are dissolved in muriatic acid, which takes away the phosphate of lime; the soft residue retaining the shape of the bone is dissolved in boiling water, cast into squares, and dried on nets. The phosphate of lime, acted upon by sulphuric acid and calcined with carbon, produces phosphorus for lucifer matches. The remaining flesh is distilled to obtain the carbonate of ammonia; the resulting mass is pounded up with potash, then mixed with old nails and iron of every description; the whole is calcined and yields magnificent yellow crystals—prussiate of potash, with which tissues are dyed a Prussian blue, and iron transferred into steel; it also forms the basis of cyanide of potassium and prussic acid, the two most terrible poisons known in chemistry.

© 1881 SCIENTIFIC AMERICIAN, INC

NEW INVENTIONS.

An improvement in wood pulp machines for preparing half-stuff of all kinds of pulp wood, whether wet or dry, has been patented by Mr. Andrew Kreider, of Annville, Pa. It consists in a stationary frame having a series of reversible double cutting rasp or file plates arranged at intervals on a plane, and a sliding frame moving thereon, provided with similar plates, and a central chamber for holding the block of wood, which is held down by a lever-regulated weight.

A trace buckle, which is easily operated with little strain upon the leather, and furnishes protection to the wearing part of the trace from the weather, has been patented by Mr. Oscar W. Moon, of Daytonville, Iowa. This invention consists in a metallic casing having a tongue pivoted in one of its open ends and a central transverse slot in its inner side for receiving a loop attached to the hame tug.

An improvement in that class of parasols which are designed to be suspended from the top, in contradistinction to being supported upon a subjacent handle, has been patented by Mr. James T. Smith, of New York city. The particular type of parasol or umbrella upon which this invention is an improvement is that in which the ribs are closed by the upward travel of the runner instead of its downward movement, as usual. This invention consists in the peculiar construction and form of the notch, to which the runner and braces converge. It is short, flat, and circular or ring-shaped, having a hole at the top through which the rod or staff projects. This notch has a recessed lower side to receive the upper end of the runner and its attachments when the umbrella or parasol is closed.

An improvement in annunciators has been patented by Mr. David Rousseau, of New York city. This invention relates more especially to electrical annunciators for use as call signals in hotels or other places to announce the location or nature of the call, and also for burglar or other alarms, to indicate the window, door, or room at which the circuit has been closed. The leading feature of this invention may be briefly stated to consist in a double-faced name plate or tag, having its two faces at right angles to each other, or nearly so, and arranged to circumscribe or inclose two sides of the magnet, and pivoted at the bisection of the angle on an axis passing preferably through, or partly through, the body of the magnet.

Mr. Levi McNall, of Allegany, N. Y., has patented an improvement in the class of wooden fences which are self-supporting without the aid of posts set in the earth, and whose independent panels are connected so as to adapt them to be readily detached one from the other. The improvements pertain to the construction and arrangement of the posts in connection with the rails of the fence.

An improved button and the method of ornamenting the same, has been patented by Mr. Charles L. Woodbridge, of Brooklyn, N. Y. The object of this invention is to produce in buttons of pearl, bone, or other suitable material, in a comparatively inexpensive manner, the effects or appearance of inlaid or inserted work or figures. The invention consists in cutting the pattern, figure, or design entirely through the button blank, in then securing on the back of the blank, with some suitable adhesive substance, a piece of metal foil, gilt, silvered, or otherwise colored paper, etc., that shall be seen through the open pattern or design, and in then applying over the back of the button, hard and smooth, a coating of collodion, celluloid, asphalt, varnish, cement, or other suitable material.

An improved fastening for gloves, which permits of fastening thick and heavy gloves very conveniently, has been patented by Mr. S. Oscar Parker, of Littleton, N. H. The invention consists in a short bar or lever with heads or knobs, mounted so as to slide in a swiveled head or button that is attached by an eyelet to the glove opposite the button hole, the bar and head or button being passed through the button hole, and the bar then turned to rest transversely over it.

Mr. John W. Maltby, of Rochester, N. Y., has patented an improved truss hoop for coopers' use, the laps of which are so riveted that they will not draw apart nor split, and the irons so applied that they will not come on the inside of the hoop. The laps are secured by diagonally bent binding irons riveted to the sides and periphery of the hoop.

Messrs. Joseph Lepine, Fils, and Pierre H. Roelants, or Brussels, Belgium, have patented an apparatus for holding skins and hides, whereby the application of coloring matter in ornamenting the skins is greatly facilitated. The invention consists of a table, having a cylindrical shape, on which the skin to be colored and ornamented is placed, and each side of the table is provided with a rotary shaft, a series of wires extending from one shaft to the other over the surface of the table, the two shafts being operated, by means of a central lever, in such a manner as to draw or press all the wires simultaneously upon the surface of the table.

An improved step for passenger coaches has been patented by Mr. Sylvester J. Tucker, of Richmond, Va. This invention relates to an improved additional adjustable step to lessen the distance between the ground and the front step of railway passenger coaches, it being designed principally for the convenience of women, children, and aged and infirm persons, who experience great inconvenience and even danger in mounting the higher steps now in use,

An improvement in slide valves has been patented by Mr. William S. Hughes, of Long Island City, N. Y. The main object of this invention is to reduce or prevent the noise made by the exhaust steam of engines, which has heretofore been attempted by the use of muffles and similar devices. This is accomplished by the valve in the steam chest, which is constructed to wire-draw the steam or break it up into fine streams as it leaves the cylinders, thus controlling each exhaust separately instead of the combined exhaust, securing freedom from dirt and other matters liable to clog the device, and further obtaining a steady continuous draught in the smokestack instead of a series of explosions, as heretofore.

The Telegraph in Arctic Exploration.

It is suggested by Mr. James Gamble, General Superintendent Western Union Telegraph Company at San Francisco, that profitable use might be made of the electric telegraph in Arctic exploration.

His plan would be to use light steel wire—say number 20 gauge—weighing about twenty pounds to the mile. The wire, coiled on reels, could be hauled on sledges, either by men or dogs, over the snow or ice, paying it out as the advance exploring party went along. By this means the party would keep in constant communication with their base of supplies. They would have no cause for uneasiness about getting lost or beyond the means of rescue, as they would be able at any moment to call for aid. With this feeling of the certainty of relief in case of accident, they would not hesitate to push their explorations to a distance far beyond what would be considered safe in the absence of means of telegraphic communication with the main body. And should any accident happen to the advance party of explorers, or should they require a further quantity of supplies, the line of wire would serve to guide those going to the rescue straight to the spot where the explorers were camped. It would also serve as a guide for their return, materially lessening the chances of danger to life and loss of the party. Having established a base of supplies at some central point, there would be nothing to prevent several exploring parties being sent out at the same time in different directions, they reporting each night to the central station the progress and observations made during the day. Directed in this way the practicability of one route over another could, from the telegraphic reports sent in, be determined upon, and much time that would otherwise be wasted in vain endeavors to make way over barriers of ice, be saved. As hard frozen ground, dry snow, or ice is a perfect insulator, no poles to string the wire would be required. It could be paid out on the snow or ice by the party as they went along. The generally accepted theory of those familiar with the Arctic regions is that the ice is seldom more than five or six feet in thickness, so that by boring through it with a common drill or through the frozen ground, there would be no difficulty in obtaining a good ground connection to complete the electric current. It would not be necessary to carry any battery material. One main battery at the central station would be all that is required. For a distance of 100 to 150 miles telephones could be used, dispensing with practical telegraph operators. Still, it might be advisable to have some of the party possessed of a practical knowledge of telegraphy.

At 20 pounds to the mile, 100 miles of wire would only weigh 2,000 pounds. It could be wound on reels in size easy to handle. The cost of steel wire of that gauge is about 20 cents a pound, so that the total expense, including cost of reels, winding, etc., would not exceed $1,000.

Wastefulness in the Use of Steam.

As scientific investigation has established the fact that the best forms of modern steam engines develop only a fraction of the power which should be obtained from the combustion of the fuel consumed in the boiler, it will be instructive to ascertain the nature of these losses, in order if possible to apply a remedy. In tracing out the causes of the loss of power in the steam engine, the first and greatest element doubtless resides in the difficulty—we may be justified, perhaps, in saying the impossibility—of burning solid fuel economically in any form of furnace that has yet been devised, and for the following reasons:

The buyer of coal purchases, at the outset, at least ten to fifteen per cent of non-combustible and useless material in the form of ash, which should of course be deducted from the weight of the fuel to get at the quantity of available combustible. Starting with this quantity, probably not less than five per cent of useful combustible is lost by falling through the grate bars in the form of dust or partially burned fragments that find their way into the ash pit unutilized.

Again, in no form of furnace that has yet been devised, has it been found possible to retain the gaseous products of combustion generated in the furnace long enough in contact with the steam generating surfaces to yield up all their available heat; on the contrary, they are thrown out of the chimney frequently at a temperature as high as 800°.

Again, combustion is frequently so imperfect, that great quantities of unconsumed carbon are carried off out at the chimneys, with the furnace gases, in the form of smoke, unutilized, and representing a sad waste of heating power.

Another item of loss is found in the cold air with which the furnace is fed, and which must be highly heated before it will begin to combine with the combustible elements of the fuel, and which must necessarily abstract this heat from the glowing coals through which it passes; and this item of loss is often a serious one where there is careless stoking and the furnace doors are frequently opened, permitting great volumes of cold air to rush into the fire space.

Again, we must take into consideration a variable and often considerable percentage of loss of heating effect due to the radiation and conduction of heat from the generator to surrounding bodies.

And finally, we must take into consideration the loss involved in the passage of steam from the boiler to and through the engine.

Summing up all the items of loss in the steam generator, it is probable that with the best boiler which it has been possible to construct, not more than fifty per cent of the thermal effect of the fuel is utilized in the generation of steam, and of this fifty per cent from fifteen to thirty per cent is lost somewhere during the passage of the steam from the boiler to and through the engine, by condensation in steam pipes, friction of the moving parts of the engine, and so forth, leaving us but twenty-five to thirty per cent of the duty actually realized, that theory demands we should have.

It seems somewhat absurd in the face of these facts to see and hear statements to the effect that the possibilities of improvement in the duty of the steam engine have been exhausted. Our inventors need not puzzle their brains concerning new motors so long as they have a margin of seventy-five per cent before them for improving the steam engine.—*The Milling World.*

A Gigantic Corn Sugar Factory.

The Chicago Sugar Refining Company are building a factory to convert 25,000 bushels of corn into sugar a day, or something like 8,000,000 bushels a year. The buildings cover 320,000 square feet, and are expected to cost $1,500,000. The sugar house is 160 feet square, with eleven stories and basement, or 140 feet high. It is to be of wood and brick, containing 4,000,000 bricks. It will be supported by 90 piers of masonry, resting on piles, each pier carrying about 400 tons. There will be required 42,000 forty-foot piles, or 318 miles of piling.

Adjoining the sugar house is a building for corn, 60 by 160 feet, and three stories high. It contains five large steam engines, two pumping engines, one flowing engine, and several small steam pumps. The pumps have a capacity of 10,000,000 gallons per day. The steam engines will be equal to 2,000 horse power, and the blowing engine blower furnishes a blast for 7,000 horse power boilers.

Next to the corn house is the filter house, 120 by 100 feet, and eleven stories high. This building is a fireproof one, built of brick, iron columns, wrought iron floor beams, with brick arch floors. Its twenty-four piers carry 500 tons each, or 12,000 tons. There are 2,500 forty-foot piles driven 50 feet below the surface.

The next building is a corn house, 60 feet square and three stories high, with machinery in it to empty the cars automatically.

The next is a boiler house, 75 by 150 feet in size, three stories and basement, with a coal bin suspended above the boilers to feed them automatically with coal. The boilers have a capacity of 7,000 horse power. There are twenty of these known as the Babcock & Wilcox section boilers.

The chimney for the house is 240 feet high, with a 12 foot inside flue. The base is 40 feet square.

Between the boiler house and the chimney is an "economizer," that the waste gases of the boilers pass through on the way to the chimney. By this means the heat is utilized by pumping the feed waters of the boiler through this economizer.

The works will commence with 12,000 bushels of corn per day, which will soon increase to 25,000 per day. The corn can be received by car or vessel, and the goods likewise shipped.

The company will manufacture all kinds of starch for laundry and culinary purposes, sirup, and grape sugar.

The Treatment of Constipation by the Swedish Movement Cure.

In order the more readily to convey a definite idea of the principles on which the Swedish movement cure is based, and the mode in which these principles should be carried into practical execution for the relief of chronic constipation, Dr. Benjamin Lee, at a recent meeting of the Philadelphia County Medical Society, stated that, in addition to the movements which afforded the introduction of oxygen in the blood, the rapid rotation of the entire trunk upon the pelvis promoted activity in the portal circulation and stimulated peristaltic action of the intestines; that, in order to relieve congestion of the liver and excite a healthy flow of bile, the patient should assume an attitude that would place the muscles of the right side strongly on the stretch, while the operator produced a rapid vibration of the parietes of the chest and abdomen immediately over the liver. Finally, the patient assuming a recumbent posture, thorough kneading of the abdomen is given, followed by pressure and vibration over the solar plexus. The circulation of all the abdominal viscera is thus stimulated, the passage of both chyle and fæces through the alimentary canal is aided, healthy secretion is promoted, undue accumulations of mucus are dislodged, and the great nervous centers of the organic system are roused into the highest state of activity. There are very few cases of constipation, however obstinate, which will resist a fortnight of this treatment daily, and many cases will yield in a week. The manipulation occupies about one hour.—*Medical and Surgical Reporter.*

© 1881 SCIENTIFIC AMERICIAN, INC

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Mfrs "Excelsior" Machy, address E. D. Payne, Dayton, O

Four applications of German Corn Remover cure the worst corns without pain or annoyance. 25 cts. Druggists.

Blake's Patent Belt Studs. The strongest fastening for leather and rubber belts. Greene, Tweed & Co.

It must be good, as bank presidents indorse it. What? Van Beil's 'Rye and Rock."

Makers of best Factory Elevators (power) and Automatic Guards, send description and cost to Carr, Ryder & Wheeler, Dubuque, Iowa.

Spring freshets and rain will fill our boiler with sediment and scale, causing foaming and burning. These can be prevented by Hotchkiss' Mechanical Boiler Cleaner. Send for circular. 84 John St., New York.

To realize a portion of the profits of the enormous crop of apples annually produced in the U. S., it is only necessary to purchase one of Boomer & Boschert's Cider Presses. The price is reasonable. Send for illustrated circular to New York Office, 15 Park Row.

Mr. T. P. Pemberton, who is well known to us and many of our readers and advertisers, will sail for England in the early part of July next. As he will visit Liverpool, Manchester, Leeds, and London, any party who may wish to transact business, or obtain information in reference to anything in the manufacturing or mechanical line, will do well to communicate with him. Mr. Pemberton is a native of England, and has had good experience as an educated engineer, draughtsman, and writer for mechanical journals. His address is 5 Dey St., room 13, New York.

A beautiful fit may be secured in boots or shoes without discomfort by using German Corn Remover. 25 cts.

Walrus Leather, Walrus Wheels, Pure Turkey Emery, Star Glue for Polishers. Greene, Tweed & Co., N. Y.

For Sign Lettering Device, address J. J. Callow, 56 Beech St., Cleveland, O.

Wanted.—Plater's Outfit, 2d-hand, including lathes, tanks, etc. Address "Baldwin," P. O. Box 2162, N. Y.

Robinson Machine Works, Poughkeepsie, N. Y., build and place in market patented articles.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

Houghton's Boiler Compound contains nothing that can injure the iron, but it will remove scale and prevent its formation. Houghton & Co., 15 Hudson St., N. Y.

Tarred Roofing and Sheathing Felts. A. Wiskeman, Paterson, N. J.

Portable Railway Track and Cars. Contractors, Planters, Miners. send for circulars. Francis W. Corey & Co., & 7 Dey St., New York; 59 & 61 Lake St., Chicago., Ill.

Punching Presses & Shears for Metal-workers, Power Drill Presses, $25 upward. Power & Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N. Y.

Improved Skinner Portable Engines. Erie, Pa.

"Rival" Steam Pumps for Hot or Cold Water; $32 and upward. The John H. McGowan Co., Cincinnati, O.

The Eureka Mower cuts a six foot swath easier than a side cut mower cuts four feet, and leaves the cut grass standing light and loose, curing in half the time. Send for circular. Eureka Mower Company, Towanda, Pa.

The Newell Universal Mill Co., Office 34 Cortlandt St., New York, are manufacturers of the Newell Universal Grinder for crushing ores and grinding phosphates, bone, plaster, dyewoods, and all gummy and sticky substances. Circulars and prices forwarded upon request.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers. Philadelphia. Correspondence solicited.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works. Drinker St., Philadelphia, Pa.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited. Erie, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 10 Cortlandt St., N. Y.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts. Importers Vienna lime, crocus, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Blake "Lion and Eagle" Imp'd Crusher. See p. 350.

Gardiner's Pat. Belt Clamp. See illus. adv., p. 349.

For best Duplex Injector, see Jenks' adv., p. 349.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 349.

Eclipse Fan Blower and Exhauster. See adv., p. 348.

4 to 40 H. P. Steam Engines. See adv. p. 349.

Peck's Patent Drop Press. See adv., page 366.

Long & Allstatter Co.'s Power Punch. See adv., p. 365.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 364.

Saw Mill Machinery. Stearns Mfg. Co. See p. 364.

Saunders' Pipe Cutting Threading Mach. See p. 366.

For Sequeira Water Meter, see adv. on page 364.

For Machinists' Tools, see Whitcomb's adv., p. 364.

The American Electric Co., Proprts Mfrs of Thompson Houston System of Electric Lighting the Arc Type.

See Bentel, Margedant & Co.'s adv., page 381.

Clark Rubber Wheels adv. See page 380.

The Twin Rotary Pump. See adv., p. 350.

Diamond Drills, J. Dickinson, 64 Nassau St., N. Y.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

Telegraph, Telephone, Elec. Light Supplies. See p. 380.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 381.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 381.

Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

For the manufacture of metallic shells, cups, ferrules, blanks, and any and all kinds of small press and stamped work in copper, brass, zinc, iron, or tin, address C. J. Godfrey & Son, Union City, Conn. The manufacture of small wares, notions, and novelties in the above line, a specialty. See advertisement on page 381.

Gear Wheels for Models (list free); Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Gould & Eberhardt's Machinists' Tools. See adv., p. 381.

Safety Boilers. See Harrison Boiler Works adv., p. 381.

The Medart Pat. Wrought Rim Pulley. See adv., p. 381.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 381.

Steam Engines; Eclipse Safety Sectional Boiler. Lambertville Iron Works, Lambertville, N. J. See ad. p. 381.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 381.

Lathes, Planers, Drills, with modern improvements. The Pratt & Whitney Co., Hartford, Conn.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 380.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 381. Totten & Co., Pittsburg.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) L. H. asks for a good method of waterproofing cloth. A. Saturate the fabric with a strong hot aqueous solution of soap, press out excess, and transfer to a second bath consisting of a strong aqueous solution of sulphate or acetate of alumina or acetate of lead, for several hours. Repeat if necessary, press out excess of liquid, and dry, not too rapidly, in the air.

(2) J. M. asks for a reliable receipt for violin varnish. A. Coarsely powdered copal and glass, each 4 oz.; alcohol, 64 o. p., 1 pint; camphor, ½ oz.; heat the mixture, with frequent stirring in the water bath so that the bubbles may be counted as they rise, until solution is complete, and when cold decant the clear portion. When oil varnish is used it is made as for artists' virgin copal.

(3) E R. J. asks how to make a large number of copies of manuscript in black ink. A. Try the following: Use the gelatine pad made with a large proportion of glue. Soak writing paper in alum water to saturation and dry carefully. Write with any ink on the prepared paper, and use as in the gelatine pad process; the parts of the gelatine surface not protected by the ink will be affected by the alum so as to leave a stencil which can be used by inking with a roller as in the electric pen process.

(4) A. R. T. asks how to proceed to bleach gutta percha. A Dissolve the gutta percha in twenty times its weight of boiling benzole, add to the solution plaster of very good quality, and agitate the mixture from time to time. By reposing for two days the plaster is deposited and carries down with it all the impurities of the gutta percha insoluble in benzole. The clear liquid decanted is introduced by small portions at a time into twice its volume of alcohol of 90 per cent, agitating continually. During this operation the gutta percha is precipitated in the state of a pasty mass, perfectly white. The desiccation of the gutta percha thus purified requires several weeks' exposure to the air, but may be accelerated by trituration in a mortar, which liberate moistures which it tends to retain.

(5) S. G. inquires how to remove grease spots from clothing. A. According to the *Pharmacist*, fatty oils have a greater surface tension than oil of turpentine, benzole, or ether. Hence, if a grease spot on a piece of cloth be moistened on the reverse side with one of these solvents, the tension on the greasy side is larger, and therefore the mixture of benzole and fat or grease will tend to move towards the main grease spot. If we were to moisten the center of this spot with benzole, we should not remove it, but drive the grease upon the clean portion of the cloth. It is, therefore, necessary to distribute the benzole first over a circle surrounding the grease spot, to approach the latter gradually, at the same time having blotting paper in contact with the spot to absorb the fat immediately. Another method, namely, to apply a hot iron on one side while blotting paper is applied to the other, depends upon the fact that the surface tension of a substance diminishes with a rise of temperature. If, therefore, the temperature at different portions or sides of the cloth is different, the fat acquires a tendency to move from the hotter parts toward the cooler.

(6) E. N. B. writes: My main shaft runs 85 revolutions per minute. I want to belt on to a counter shaft and from there to a pulley 12 inches in diameter, which must run 800 revolutions per minute. I want to know the diameter of the pulley on the main shaft, also of those on the countershaft. What is the simplest rule you know of for figuring this? A. Your 12 inch pulley is to make 800 revolutions per minute. You can assume such diameter of the driving pulley on the countershaft as best suited for the work, say 60 inches; this will give the speed of the counter shaft one-fifth, or 160 revolutions per minute. You have now the speed of the countershaft 160 revolutions per minute and the driving shaft 85 revolutions per minute; the two pulleys must have the same proportion. If we assume the countershaft pulley 30 inches diameter, we then have 85 : 160 : : 30 : diameter of driving pulley—or $\frac{160 \times 30}{85} = 56{\cdot}5$ inches. So the driving pulley will be 56·5 inches on to 30 inches and 60 inches on countershaft, driving 12 inches.

(7) J. M. writes: 1. I have four cells, one gallon each, of Fuller's battery, as described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 157, Fig. 33, and I want to magnetize some compass needles. Please tell me the size of magnet required to correspond with the battery. A. Use soft iron cores, five-eighths of an inch in diameter 3 inches long, and wind with six to eight layers of No. 18 wire. 2. How is the magnetizing of compass needles done? A. By placing them against the poles of the electromagnet or by rubbing them on a permanent magnet. 3. Is my battery large enough for such work? A. Yes. 4. Is there any difference in lifting power of two magnets, both of the same size of core, same size of wire, and both having the same number of layers, one magnet being made like the letter U, the other being made in three pieces with a yoke? A. No, providing the yoke in the latter case is well fitted to the cores. 5. Which is the best, to dissolve the bichromate of potash in warm water before putting it in the cell, or to put in the crystals? A. It is best to make a good solution and pour it into the cell. 6. Is there any objection to mixing a solution of bichromate of potash with sulphuric acid, if mixed when the solution is warm? A. The acid should not be added until the solution cools. 7. Is it unhealthy to sleep in a room where Fuller's batteries are used? A. There is no special danger if the room is well ventilated; it is better, however, to not have them in the bedroom. 8. How long will carbons last in the Fuller battery? A. If they are properly prepared they should last indefinitely. 9. Will my battery work on board of a vessel at sea as well as on shore? A. Yes, providing you can keep the solutions from spilling or mixing. 10. In winding a magnet does it make any difference if I wind the core with a separate piece of wire and connect the inner ends after winding, or wind the two cores with one piece of wire? A. It makes no difference. 11. Do compass needles lose their power in course of time? A. Not generally; they may, however, under certain conditions.

(8) A. B. P. asks: What book will I want for instructions and what materials will I want to make assays for gold and silver, as I am going to New Mexico, and expect to mine, prospect, and assay? A. See article on assaying in No. 22, current volume. Consult Rickett's "Assaying and Assay Schemes."

(9) W. McK. B. asks: 1. Which is better for cemetery purposes, American or Italian marble? A. Some of the hard (slaty) Pennsylvania stones last much longer than Italian marble. 2. Is there machinery made for washing sand to make glass? What is the cheapest and best method of screening sand for above purposes? A. Yes. See "Glass" and "Screens," Knight's "Mechanical Dictionary."

(10) W. E. J. asks: 1. How is vulcanized rubber acted on by sulphuric, nitric, and muriatic acids? Does it lose its properties? A. The dilute acids scarcely affect hard rubber or vulcanite; the undiluted acids, especially nitric and sulphuric, attack and decompose it. 2. Is there any metal or other substance suitable for making pens that is not destroyed by these acids? A. Gold pens are not affected by these acids (pure) when used singly.

(11) C. E. R. writes: 1. I have one pound of No. 36 naked copper wire, and wish to construct as large an induction coil as the wire will permit. What size of spool shall I use, and what size of primary wire? Can I construct the coil on the plan of the one described in SUPPLEMENT, No. 160? A. Yes. Follow directions given in SUPPLEMENT, No. 160. 2. How large a condenser shall I use? Also how many quart cells Grenet? A. About 25 square feet of condenser surface and three to four cells of battery. 3 Will a two-quart cell, Grenet, containing three zinc and four carbon plates 4x6 inches, heat ⅛ inch of platinum wire, 36 size, hot enough to explode gunpowder? A. Yes.

(12) W. C. asks: What is used to hold together the edges of paper composing writing pads? A. It is a mixture of glue and thick starch paste with a trace of glycerine, and aniline red to color.

(13) S. H. B. asks as to the dynamo-electric machine of No. 161, SCIENTIFIC AMERICAN SUPPLEMENT. 1. Should the change from one spring to the other on the commutator occur when the armature stands with its poles within the hollows of the field magnet, or when it is at right angles to a line joining the poles of the field magnet, or in neither? A. If the machine runs slowly it should happen when the poles are at right angles to a line drawn across the poles of the field magnet; if it runs rapidly it should happen a little earlier. 2. I have made one which I think ought to work, but does not give such results as I expected. I used, as in original direction, seven layers of No. 16 on field magnet and No. 18 in armature. I intend soon to measure the resistance of each and also its current. Should the wire of the field magnet be wound in separate layers so as to join up in series or not as required? A. Yes. 3. I made the armature of cast iron, but propose to make one of soft wrought iron. A. You will probably get better results with wrought iron.

(14) A. W. S. asks: Can you tell me of any simple method by which I may determine whether water is hard or soft? A. Dissolve half an ounce of good white soap in a pint of hot rain water, let it cool and settle, and mix about an ounce of this with a pint of the water to be tested and let it stand a few minutes. If the water is soft it will remain clear, if hard it will become opalescent. 2. Is there any way to render rain water wholesome for cooking purposes without the use of a water filter? A. Put a few bushels of coarsely granular, well burned charcoal, free from dust, into the reservoir. 3. Where can I obtain a water filter? A. See column of Business and Personal.

(15) O. S. asks: 1. Will not a cylinder made of heavy sheet brass, three-sixteenths of an inch thick, brazed together with the two end pieces, brazed in and turned up true and the thread cut on it, do as well if left hollow as a solid iron cylinder? A. The hollow cylinder will answer quite as well, providing you apply a fly wheel to the cylinder shaft to render the motion equable. To get the best effects from the phonograph the cylinder must be turned with great regularity. 2. Has any improvements been made on the phonograph since you published the above direction, July 20, 1878, and if so, what is it? A. No essential changes. You might with advantage substitute a piece of stout watch spring for the wooden spring carrying the needle, and you might put a damping spring against the front of the diaphragm with a piece of rubber or felt under it. These changes will improve the articulation somewhat.

(16) J. A. S. asks how to vulcanize rubber to iron. A. In vulcanizing rubber in contact with iron so that the vulcanized rubber and metal will cohere, it is customary to coat the iron all over with a melted mixture of equal parts of genuine asphaltum and gutta percha. Soft rubber containing six per cent of sulphur when firmly pressed into contact with this coating and then vulcanized by steam heat adheres very strongly to the metal after cooling.

(17) G. W. T. asks: Will you, for the benefit of several readers in this city, please give your opinion of gasoline in the household as used in the so-called gas stoves? A. Experience has shown that it is not safe to use gasoline in the house, for gas stoves or otherwise, under any conditions.

(18) C. A. asks: 1. Can you tell me the process of etching on glass by fluorine? A. Heat the glass and coat it with an even film of beeswax or paraffine. Through this to the surface of the glass etch the characters or design with a sharp point or graver. Put into a shallow lead tray a quantity of fluoride of calcium (fluorspar) in fine powder, mix it into a thin paste with strong oil of vitriol, and set the tray on a warm sand bath. Place the glass tightly over the tray so that the hydrofluoric acid (gas) may come into contact with the prepared surface. In ten minutes the parts of the glass not covered with wax or paraffine will be properly etched. The etched lines will be translucent—if it is desired to make the etching opaque (white), the plate should be wet before exposing it. A little benzole will remove the wax or paraffine. 2. Can the materials be procured in New York? A. Yes, see our advertising columns for dealers in chemicals.

(19) J. B. E. asks: What is the cost of graphite and where obtainable? A. From seven to fourteen cents a pound. See our advertising columns for addresses of dealers. Also Hints to Correspondents.

(20) C. F. writes: 1. On a vehicle of three wheels, weighing from 1,100 to 1,200 lb., with two cylinders 2 inches bore by 4 inches stroke, wheels to be 4 feet high, with engines connected to cranks in back axle: what size boiler is required, thickness of iron, etc.? A. The boiler should be a vertical coil tube boiler, having about 70 square feet of heating surface. 2. Is there any way to make a piece of wood more durable than seasoned lumber for chisel handles, etc.? A. Yes, by impregnating the timber with some of the chemical prepartions used for preserving timber. 3. I see in the SCIENTIFIC AMERICAN a description of a canal canoe, in vol. xliii., No. 7. What we wish to know is how long, wide, and deep it should be to hold two persons of 160 lb. each? A. About 9 or 10 feet long by 3 feet wide by 16 inches or 18 inches deep to be safe. 4. Shot for guns used to be made by dropping it only four inches. Please describe how it was done. A. Lead shot are made by dropping the melted lead through a series of perforations from a height into a tank of water.

(21) F. P. asks: 1. Will adding clay to quicklime mortar improve it? If so, will I use the raw clay or must it be calcined, and how much to be used? A. The addition of any considerable quantity of raw clay to lime mortar does not improve it materially. A certain quantity of fine silicious clay, when ground with lime and strongly calcined, makes hydraulic cement. See Gillmore's "Cements and Mortars." 2. How can I make a good whitewash for outdoor wood work? A. Well burned quicklime, ½ bushel; salt, 1 quart; rice, flour, and glue, ½ lb. each; water glass (sirupy solution), 1½ pints; water, q. s. Soften the glue over night in cold water, then dissolve it in a small quantity of boiling water. Make the flour into a paste with a little hot water and add it to the glue solution. Dilute the water glass with boiling water and add the salt. Slake the lime with boiling water, then stir in the other materials with enough hot water to reduce the whole to the proper consistence for use. Stir well together, cover, and let it stand several hours before using. Use hot.

(22) C. L. W. writes: I am making a small Marie-Davy quicksilver battery, to be used in a medical machine, and I would like to know if well varnished wood would not answer in place of vulcanite in making the cells? A. Wood, well varnished with shellac or saturated with melted paraffine, will answer very well.

© 1881 SCIENTIFIC AMERICIAN, INC

(23) M. R. G. asks how to make a water glass to enable one to see the bottom of a lake, depth from 50 to 100 feet, water clear as crystal. I notice in "Scribner" mention made of a water glass in use for such purposes on the eastern coast and islands, but does not state how made. A. Any small telescope with a large objective and an eyepiece of very low magnifying power will answer very well for this purpose, provided the joint of the object glass is watertight.

(24) L. D. W. asks: In throwing water through 200 feet of hose with fire engine is the pressure on first length of hose greater than of any others? If so, why? A. When discharging, yes; because the friction of the additional length of hose expends a portion of the pressure in the first length.

(25) J. P. S. asks whether in dies used for cutting sheet iron blanks both dies must be tempered, or whether it will suffice to temper the female die only and let the male die be soft so it can be peaned up when dull. The sheet iron to be cut is 27 and 28. A. Both dies should be tempered.

(26) I. H. B. asks: 1. What is the best lubricant for the main journals of large engines? I use clean cotton waste with lubricant on top of it; the waste serves to catch the grit if any and mitigate the flow of hot oil. Is there anything better? A. Some of the special mineral oils are used as you describe. 2. Should cylinder cocks be left open in running when they are made to work automatically and the engine works equally well with them shut? A. No. 3. Whose work best treats of heat and power as applied to mechanical forces? A. "Cotterill on the Steam Engine as a Heat Engine." 4. Which is the most economical in practice, a single cylinder expanding the steam down to the atmospheric line, or a compound engine of the same initial capacity—steam pressure and vacuums of each being equal and making the same number of revolutions per minute? A. Theoretically there should be no difference, but practice favors the compound engine.

(27) J. H. A. writes: I notice that nearly all force and lift pumps have an air chamber through which the water is forced. Is the chamber any advantage except to deliver the water in a continuous stream, and perhaps make the force a little easier; and does it make the lift more effective? A. The use of an air chamber is to prevent shocks, or "water hammer," in the pipes, and render the delivery more uniform. It does not make the pump more effective.

(28) F. A. B. asks: Would it be possible to carry steam 300 feet through 2½ inch pipe well covered, with 100 lb. pressure to drive engine? What lineal expansion would there be, and what loss by condensing, etc.? A. Yes; the pressure at the engine would probably be 3 lb. to 5 lb. less than at the boiler when the engine is running. Expansion 6½ to 7 inches. Condensation depends upon covering, it may be from 0·08 to 0·3 lb. water per square foot of surface per hour.

(29) G. W. G. writes: I am making a Holtz electric machine, from directions in SUPPLEMENT, No. 279, with a 12-inch revolving plate. 1. On which side of the apertured glass are the paper inductors pasted. Also, are the gilt papers on the same side as the inductors? A. The inductors and gilt paper are on both sides of the glass. 2. Is it necessary that the spindle holding the revolving plate be perfectly insulated? A. No. 3. Can anything else but vulcanite be uesd to excite the mechine? A. Anything that will generate enough electricity will answer but vulcanite is probably the best.

(30) M. S. asks: Can wrought iron anvils plated on the face with steel be retempered? If so, what is the best way to temper them? A. You can try the experiment by filling a vessel (large enough to contain the anvil) with water; place bricks or other support for the anvil, so that the top of the anvil will be about one inch below the top of the vessel; have a hogshead or tank filled with water and elevated 5 to 10 feet above, with a pipe from it so arranged as to discharge water on the face of the anvil. When the anvil is properly heated lower it into the first tank face upward, then open the pipe from the higher tank to discharge the water on the face of the anvil till it is cooled. When you open this pipe, keep away from the anvil, as if any portion of the steel is not welded, it may crack and fly off with considerable force.

NEW BOOKS AND PUBLICATIONS.

OPHTHALMIC OPERATIONS, WITH REMARKS ON AFTER-TREATMENT: THE OPHTHALMIC USE OF QUININE AND ITS THERAPEUTIC ACTION. By A. Sibley Campbell, M.D., Augusta, Ga. 8vo pamphlet, pp. 35.

The first of these papers consists of a description of several cases of diseases of the eye which came under the author's treatment, and which form the basis of certain remarks which he subsequently makes in regard to the after-treatment in cataract extraction and other surgical operations on the eye, together with a consideration of the therapeutical action of quinine in such cases. Among the manifold applications of quinine in diseased conditions of the system it is found especially applicable in abnormal conditions of the eye, whether these have resulted from disease or from surgical procedures. Nowhere in the text books on therapeutics is there given or attempted a *generalization* of the action of this valuable remedy. In the paper before us, the author attempts to supply this wide-felt deficiency by enunciating the following views, which are essentially those published by Dr. Robert Campbell in 1858-9. The prominent and specific action of quinine is due to its direct influence on the vascular system through its power of contracting the blood vessels, acting thus on their middle or muscular coat, and hence on the unstriped, assisted, possibly, by the elastic fibers constituting that structure. This action is *primarily* on the blood vessels, especially on the small arteries, where muscular fiber predominates, and without the intermediary action of the vasomotor system. Possibly the vasomotor system afterwards aids in the process of contraction; but if so, only secondarily, by the same general influence now exerted, with the rest, on its own circulation. Hence the action of quinine on the vascular system is that of a *constringent*, and its effects may be termed *syntonic*. Such being the action of the remedy on the vascular system at large, the explanation of its therapeutic influence in abnormal conditions of the eye follows as a corollary.

LATHE WORK. By Paul N. Hasluck. London: Crosby, Lockwood & Co.

Amateur turners will find in this well made book a handy treatise on turning tools, appliances, and processes. The author has evidently wrought out his knowledge of the lathe at the lathe, while his experience as editor of a journal largely devoted to mechanics has taught him both the popular need of the information he gives and the art of conveying practical instruction directly and clearly.

ILLUSTRATED RECORD OF BRITISH PATENTS. January to March 1, 1881. London: Office of the *Engineer*.

For many years the *Engineer* has printed from week to week abstracts of all the patent specifications filed in the British Patent Office. It has now with commendable enterprise, begun to reprint periodically these specifications with illustrations, indexes, reports of patent decisions, and related matters, after the manner of the official United States *Patent Gazette*. There can be no question of the public utility of such a periodical, and it does not speak well for the British authorities that such a work is left to be done by private enterprise.

A MEMORIAL OF JOSEPH HENRY. Published by order of Congress. Washington: Government Printing Office.

A special edition, on tinted paper with wide margins, of the Henry memorial volume. It contains the proceedings in Congress with respect to the commemoration of Professor Henry's life and services: obsequies; memorial exercises at the capitol; memorial proceedings of societies, and the proceedings in Congress regarding the erection upon the grounds of the Smithsonian Institution of a bronze statue of the late Secretary of the Institution.

HISTORY OF WOMAN SUFFRAGE. Edited by Elizabeth Cady Stanton, Susan B. Anthony, and Matilda Joslyn Gage. In two vols. Vol. I. 1848—1861. New York: Fowler & Wells.

The editors have aimed to put into permanent shape the scattered reports of the woman suffrage movement still to be found, and to gather an arsenal of facts and arguments for the furtherance of the movement—"the first organized protest against the injustice which has brooded over the character and destiny of one half the human race." The work is illustrated by finely engraved steelplate likenesses of Frances Wright, Ernestine L. Rose, F. D. Gage, Clarinda I. Howard Nichols, Paulina W. Davis, Lucretia Mott, Amelia Bloomer, Susan B. Anthony, M. C. Wright, Elizabeth Cady Stanton, and Matilda Joslyn Gage.

THE DETECTION AND CORRECTION OF VISUAL IMPERFECTIONS WITH TEST TYPE. By Dr. C. A. Bucklin. New York: Spencer Optical Manufacturing Company. $1.

Although specially intended for the guidance of dealers in eyeglasses and similar aids to imperfect vision, this little manual may be of use to any one who wishes to inform himself as to the nature of the more common eye troubles and the character of the glasses best suited to delay, relieve, obviate, or cure such disabilities. The book is practical, clear, and reasonably free from technicalities.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

May 17, 1881,

AND EACH BEARING THAT DATE

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Adhesive compound, N. S. White 241,576
Apartment house, P. G. Hubert 241,493
Axle lubricator, Marks & Iverson 241,500
Axle lubricator, J. Stephenson 241,746
Bail fastener, J. A. Marston 241,683
Bales in vessels, apparatus for stowing cotton, J. F. Taylor 241,752
Barrel heating and drying apparatus, Parson & Northey 241,711
Beehive, H. Eitenmüller 241,638
Belt stretcher, P. S. Graham 241,489
Billiard table, J. B. Boyd 241,473
Billiard table, W. Buttery 241,607
Blower for open stoves, G. Wellhouse 241,574
Boiler furnace, steam, J. Enright 241,480
Boiler heater and filter, combined, T. A. Myers 241,506
Book, copying, S. Smith 241,566
Book rack, T. Gilfillan *et al* 241,645
Boot and shoe, G. W. Dean 241,627
Boot and shoe lasting mechanism, L. R. Blake 241,524
Boot and shoe vamps and uppers, machine for cutting, J. W. D. Fifield 241,532
Boots and shoes, winter sole for, T. Shaw 241,733
Boring bar, L. R. Faught 241,481, 241,482
Boring machine, metal, L. R. Faught 241,483
Boring mill, G. T. Reiss 241,719
Breast strap, P. Schneider 241,729
Brick pallet, R. Thomas 241,754
Bridge, truss, J. Wall 241,763
Bridle bit, H. S. Squier 241,745
Burling wool and carbonizing cotton in mixed rags, apparatus for, H. Dainty 241,624
Butter package, E. M. Crandal 241,478
Button and stud, C. Robinson 241,722
Button fastener, W. H. Sproston 241,518
Canal and river lock, H. Harding 241,651
Car brake, W. Haddock 241,538, 241,539
Car brake, automatic, D. S. Randolph 241,510
Car coupling, F. O. Deschamps 241,629
Car heater, F. L. Kinsman 241,547
Car starter, street, R. Hermance 241,657
Car, stock, S. Bray 241,600
Car, stock, H. Cull 241,623
Car, stock, W. S. Hunter 241,542
Cars, switch operating attachment for street, E. A. Eckert 241,637
Carpet sweeper, M. R. Bissell 241,472
Carriage, S. M. Chester 241,618
Cart, dumping, P. Inglart 241,665
Cart, hand, W. H. Kelly 241,545
Casting steel ingots, J. & C. J. Tranter 241,758
Castings, manufacturing solid steel, J. Reese 241,718
Cereals to separate the oily germs, flour, and starch, for the use of distilleries, etc., treating, F. Camus 241,476
Cesspools, apparatus for emptying and removing the contents of, N. Talard 241,751
Chain, drive, J. L. Pope 241,717
Chair, S. L. Saunders 241,728
Chinoline, manufacture of artificial, Z. H. Skraup 241,738
Cigar machine, O. Hammerstein 241,540
Cigarette machine, G. E. Bovee 241,599
Clevis adjuster, plow, J. H. Palm 241,709
Clipping machine, sheep, J. K. Alwood 241,584
Cockeye and hook for traces and neck yoke straps, M. Miller 241,690
Converters or other furnaces and the preparation of lime used therefor, lining Bessemer, Thomas & Gilchrist 241,570
Corn sheller, C. P. Ferrier 241,531
Corset, P. E. Banker 241,589
Cotton receptacle, M. B. Wever 241,765
Cotton sprinkler, J. A. Wolfram 241,577
Crank pin, adjustable, E. Gould *et al* 241,488
Culinary vessel, M. S. Duffy 241,631
Cultivator, C. Mendenhall 241,687
Cultivator, A. J. Nellis 241,697
Currycomb, G. W. King 241,546
Curtain fixture, P. B. Smith 241,743
Cutlery, manufacture of, J. Beecher 241,471
Depilating animal carcasses, apparatus for, D. H. Sherman (r) 9,714
Dipping frame, A. Lyon 241,499
Dish handle, J. B. Timberlake 241,756
Ditching machine, J. R. Vinnedge 241,520
Door buffer, I. Buckman 241,603
Door wicket, Garcin & Baldwin 241,485
Drying apparatus, I. W. Bailey 241,588
Drying apparatus, T. S. Harrison 241,653
Drying chamber conveyer, B. R. Hawley 241,541
Dyeing colors on cotton or textile fabrics, T. & R. Holliday 241,661
Eggs, device for coating, J. W. Howell 241,492
Ejector for vacuum brakes, F. W. Eames 241,635
Electrical signaling apparatus, H. W. Southworth 241,517
Elevating chair, J. G. Cannon 241,614
Elevator safety grappling device, T. A. Weston 241,764
End gate for wagon boxes, W. J. Forbes 241,484
End gate, wagon, M. F. Allen 241,582
End gate, wagon, E. Shaw 241,732
Evaporating and cooling apparatus, E. Ayres 241,587
Feeding stock on cars, device for, J. S. Butterfield 241,475
Fencing, metallic barb, J. & W. M. Brinkerhoff 241,601
File, bill, G. W. Plummer 241,716
Finger ring, Wodiska & Lindenborn 241,521
Fire escape, J. Payne 241,509
Fireplace, G. R. Ricketts 241,720
Fireplace, open, Kellhofer & Eberle 241,496
Folding box, J. P. Buckingham 241,525
Folding chair, E. C. Flint 241,533
Foot power, Kearney & Wilcox 241,544
Foot press for jewelers, etc., H. W. Chapman 241,617
Friction brake, A. O. Frick 241,642
Fruit jars and other vessels, closing, W. Vom Hofe 241,762
Gas by electricity, lighting, S. Gardiner, Jr. (r) 9,709
Gas motor engine, N. A. Otto 241,706, 241,707
Gate, A. Berdan 241,593
Gate, H. Salisbury 241,727
Glass, etc., ornamenting, J. Bardelli 241,590
Glove fastener, J. Whitby 241,767
Gold, silver, and other ores, apparatus for treating, S. M. Lillie 241,679
Governor, steam engine, P. Armington 241,585
Grain cleaner, brush, L. Gathmann 241,487
Grain meter, J. W. Hill 241,659
Grate bar, W. U. Fairbairn 241,639
Grate, shaking, J. R. Murphy 241,696
Gun, machine, M. P. Key 241,671
Hame, J. B. Law 241,676
Hame fastening, Barsaloux & Freeman 241,591
Hammer, C. J. Grellner 241,647
Harrow or cultivator, spring tooth, Springer & Ives 241,744
Harrow, spring tooth, H. Cobb 241,528
Harvester, C. W. Levalley 241,498
Harvester reel, C. F. Keller 241,669
Hat or bonnet frame, E. Whitehouse 241,766
Head rest, folding, H. Strauss 241,748
Heating apparatus, steam, E. F. Osborne 241,507
Hinge, C. D. Sigsbee 241,736
Hinge hooks, manufacture of, W. J. Lewis (r) 9,713
Horseshoe, J. A. Maguire 241,681
Horseshoe calk, H. Snyder 241,516
Horseshoe nails, machine for making, E. E. Pierce 241,562
Hub, wheel, M. L. Smith 241,567
Hydrocarbon burner, J. W. & J. R. Houchin 241,662
Hydrocarbon burner, R. Lighthall 241,773
Ice house door fastener, F. Keil 241,668
Indicator lock, F. W. Mix 241,691
Injector for furnaces, air and steam, H. E. Parson 241,710
Ink and fluid, writing, J. E. Mallory 241,682
Inlaying metallic harness trimmings, etc., with plastic materials, F. Crane 241,622
Insect trap, S. B. Knapp 241,672
Iron, manufacture of sheet, I. E. Craig 241,529
Isinglass, obtaining, I. Stanwood (r) 9,715
Kettles, pots, etc., ear for, L. B. Noble 241,559
Key ring, G. W. Miller 241,502
Knife blades, burnishing, L. Taber 241,750
Knitting machine, circular, J. L. Branson 241,474
Knob, door, W. D. Hughes 241,664
Lactometer, F. Heeren 241,655
Ladder chair, step, D. R. Knight 241,548
Lamp burner, T. Kennedy 241,670
Lamp burner, A. Thurlow 241,755
Lamp, electric, D. W. De Forest 241,628
Lamp globe and chimney combined, P. Schneider 241,730
Lantern, signal, J. J. Robinson 241,723
Last, D. F. Burtt 241,606
Last, Martin & Merrill 241,684
Latch, gate, A. L. Grayson 241,646
Leather scratching machine, T. J. & T. H. Gifford 241,644
Licorice, etc., machine for rolling or spinning into cylindrical form, G. E. & J. H. Grimm 241,536
Lifting jack, J. S. Case 241,615
Loom shuttle box mechanism, L. J. Knowles 241,549
Lozenge, etc., Gardiner & Hodge 241,486
Magnet, electro, P. B. Delany (r) 9,708
Marble, artificial, W. Burnet (r) 9,705
Mashing machine and mixer for brewers' use, A. Pfund 241,715
Meat slicing machine, R. B. Pumphrey 241,564
Mechanical movement, J. Harris, Jr 241,652
Metals with zinc, coating, H. Roberts 241,721
Middlings purifier, M. J. Schott 241,514
Middlings, separator, W. J. Fender (r) 9,706
Mill for pulverizing hard and refractory materials, C. Ross, Jr 241,513
Milling cutter, A. Muir 241,695
Milling tools for grinding, machine for holding, S. Lawton 241,497
Mirror, combined hand and stand, F. W. Ritter, Jr. 241,512
Monument for marking lines and corners of land surveys, etc., J. B. Bausman 241,592
Mower, lawn, E. G. Passmore 241,508
Mowing machine, R. Dutton 241,634
Nailing machine, A. Knowlton 241,550
Neckwear, retaining device for, M. Hellman 241,656
Oil can, J. Skerry 241,737
Oiler, S. B. Parker 241,561
Organ stop action, reed, J. A. Smith 241,740
Organ stop action, reed, J. W. Trainer 241,757
Paint compound, A. M. Fenner 241,640
Paint for ships' bottoms, M. F. Morrison 241,694
Pamphlet, J. W. Wells 241,575
Pants, J. Schuller 241,731
Paper, etc., for reproducing drawings and designs, preparing, H. Pellet 241,713
Paper, manufacture of, P. Ambjörn 241,522
Pavements, etc., mosaic work for, P. Würtz 241,771
Percussion drill, F. H. Ober 241,705
Petroleum and other substances insoluble in water, jellifying, C. T. Du Motay *et al* 241,505
Pipe and casing, shoe for driving, P. Patterson 241,712
Pipe wrench, J. T. Hayden 241,490
Pipe wrench, W. T. Kosinski 241,674
Planing machine, metal, F. A. Pratt 241,563
Planter, hand corn, J. G. Morton 241,504
Poke, animal, D. Brintnall 241,602
Poke, animal, A. & E. Larrowe 241,675
Postal card, W. Armstrong 241,523
Power, device for transmitting, A. Jarolimek 241,494
Preserving organic substances, C. F., A. W., & A. L. Lawton 241,677
Pressure rollers, air cushion compression cylinder for, G. W. Nichols 241,702
Printing press feed gauge, E. L. Megill 241,556
Pulley, belt, P. Medart 241,555
Pulley block, J. W. Norcross 241,703
Pump, B. C. Vanduzen 241,572, 241,573
Pump, pressure fountain, M. Cooper 241,621
Pump, steam, R. J. Pettibone 241,714
Pumps and compressors, attachment for, J. Clayton 241,527
Pyrites, furnace for burning, J. Mason 241,685
Railway sleeper and chair, J. C. Rupp 241,724
Railway time tables, machine for constructing, G. W. Turner 241,519
Razor guard, L. C. Allin 241,583
Reciprocating cleaner for nuts, etc., J. Johnson 241,667
Reflector, lamp, H. E. Haley 241,649
Refrigerator chest, movable, F. E. Higgins 241,491
Roofing slates, metallic fastening for, S. Farquhar (r) 9,710
Rotative furnace, C. W. Siemens 241,515
Rule and printing form, column, G. Trimble 241,759
Sash fastener, W. P. Chamberlin 241,616
Sash fastener, F. J. Grodavent 241,648
Sash fastener, J. R. Terry 241,753
Saw for cutting snags, drag, J. W. Swales 241,749
Saw mill, gang, G. W. Nichols 241,699
Saw set, W. Dunn 241,633
Saws, air cushion compression cylinder for gang, G. W. Nichols 241,701
Saws, mechanism for oscillating the slides of gang, G. W. Nichols 241,700
School seat and back, A. Moore 241,693
Seal lock for freight cars, Dewe & Bailey 241,630
Seal trap for water closets, sewers, etc., O. W. Spratt 241,568
Seat fastener, H. P. Colby 241,620
Seed meal, machine for separating and cleaning cotton, O'Brien & Franck 241,560
Seed, etc., treatment of flax, H. T. Yaryan 241,772
Sewing machine, D. H. Campbell ..... 241,608 to 241,613
Sewing machine, W. G. Wilson *et al* 241,770
Sewing machine clutch device, J. H. Bullard 241,526
Sewing machine needle, J. W. Packard 241,708
Sewing machine, rotary shuttle, A. M. Leslie 241,553
Sewing machine, ruffling attachment, W. T. Johnston (r) 9,712
Sewing machine take up and tension device, J. Hoefler 241,660
Shade, window, P. Michel 241,689
Shaft and axle, crank, T. Turton 241,760
Ship, steam, J. E. Mouland 241,558
Siphon, Lathe & Cross 241,551
Skate, combined runner and roller, W. H. Rushforth 241,726
Sleigh or sled runner, H. B. Huntington 241,543
Snow and earth excavator, W. H. Knight 241,673
Soldering machine, can, R. R. Williams 241,769
Spark arrester, J. Abell 241,579
Spikes, machine for making, H. W. Fowler 241,641
Spindle and bolster therefor, Duffy & Whorwell 241,632
Stamp protector, J. L. Lilienthal 241,678
Starch from Indian corn and other grain, obtaining, T. A. & W. T. Jebb 241,666
Starching machine, S. Marden 241,554
Steam brake, locomotive, D. S. Randolph 241,511
Steam engine and boiler for tramways, A. Arson 241,586
Steam engine, direct acting, J. I. Eavenson 241,636
Steam engine, oscillating, J. C. Miller 241,503
Steam trap, N. P. Aldrich 241,581
Steamer and drier, wheat, C. T. Hanna (r) 9,711
Steel articles and apparatus for the same, hardening hollow, W. Lorenz 241,680
Stew pan, G. Hill 241,658
Stove, gasoline, G. L. McMillan 241,501
Strainer for the outlets of tubs and basins, W. Slow 241,739
Surgical dilator or tent, Stohlmann & Pfarre 241,569
Telegraphs, etc., sectional wire for, L. D. Hamilton 241,650
Telephone, magneto, C. Ader 241,580
Telephone signal, G. H. Bliss 241,598
Thill lug, metallic, H. L. Norris 241,704
Ticket register, E. De Jong 241,479
Time table and advertiser, E. L. Birch 241,595
Tobacco, manufacturing plug, J. H. Wight 241,768
Toe weight, G. C. Sherman 241,735
Tool, combination, W. H. Bickelhaupt 241,594
Trunk, F. H. Ransom 241,565
Twisting and spooling machine, D. C. Stover 241,747
Valve, automatic air, J. H. Blessing 241,596
Valve, combined air and check, J. H. Blessing 241,597
Valve gear, steam engine, W. Johnson 241,495
Valve stem, reversing, S. L. Hawks 241,654
Vehicle bows, slat iron for, C. Wright 241,578
Vehicle seat, A. Gundelfinger 241,537
Vehicle spring, J. S. Corban 241,477
Velocipede, G. W. Marble (r) 9,707
Velocipede, marine, Newsam & Hayes 241,698
Vise and cutter, portable pipe, G. W. Glazier 241,534
Vulcanizing apparatus, time and pressure regulator for, T. Shaw 241,734
Washing machine, Ruppert & Müllerweiss, Sr 241,725

© 1881 SCIENTIFIC AMERICIAN, INC

Water closet supply tank, W. Bunting, Jr..... 241,604
Water pipes, apparatus for detecting leakage or waste in, B. S. Church..... 241,619
Water wheel, T. B. Van Pelt..... 241,761
Whiffletree connection, G. W. Davenport..... 241,626
Wick threader, lamp, N. N. Gordon..... 241,535
Windmill, D. A. Danforth..... 241,625
Windmill, N. P. Mix..... 241,692
Window and door screen. D. H. Metcalf..... 241,688
Wire cloth, and application of same to grating and pulping machines, sharp edged, S.C.Meyer 241,557
Wire, coating, L. L. Smith..... 241,741
Wire coating apparatus, L. L. Smith..... 241,742
Wire stretcher, M. A. Howell, Jr..... 241,663
Wood, composition for filling the pores of, H. W. Mattick..... 241,686
Wrench, J. Lee..... 241,552
Yarn, machine for scouring and cleaning woolen, L. A. Upson..... 241,571
Yoke, horse, E. W. Gaylord..... 241,643

DESIGNS.

Bracelet, L. Bissinger..... 12,261
Carpet, J. B. Neil..... 12,268
Earring and other jewelry, H. G. Mackinney..... 12,266
Finger ring. G. Krementz..... 12,264
Knitted fabric and fringe, G. Upton..... 12,267
Musical instrument, mechanical. Turner & Arno.. 12,269
Shade pendant, A. W. Lane..... 12,265
Type, font of printing, D. W. Bruce..... 12,262
Type, font of printing, H. Ihlenburg..... 12,263
Type, font of printing, A. Will.....12,270, 12,271

TRADE MARKS.

Baking powder, Royal Baking Powder Company.... 8,219
Beer and ale, lager, F. Hollender..... 8,213
Beer, lager, Bernheimer & Schmid..... 8,193
Beer, lager. F. Hollender..... 8,212
Bitters. stomach, H. Bischoff & Co..... 8,197
Cards, playing, New York Consolidated Card Company..... 8,224, 8,225
Cigars, P. L. Chambers..... 8,200
Cigars, cigarettes, and chewing and smoking tobacco, Goodwin & Co..... 8,210
Cigars, cigarettes, and chewing and smoking tobacco, plug tobacco, and snuff and granulated tobacco, G. W. Van Slyke & Co.. 8,229
Cigars, cigarettes, and smoking and chewing tobacco. C. G. Emery 8,201, 8,203
Cigars, cigarettes. and smoking and chewing tobacco. Lozano, Pendas & Co..... 8,215
Cigars, cigarettes, and smoking tobacco, T. H. Hall 8,211
Cigars, cigarettes, smoking and chewing tobacco, Goodwin & Co..... 8,207
Flavoring extracts, Royal Baking Powder Company 8,218
Flour, H. Becker & Co..... 8,192
Flour, J. B. Ficklen & Sons..... 8,204
Flour, Thomas & Co..... 8,223
Gloves, Wertheimer & Co.. 8,230
Hair wash, C. Marchand..... 8,216
Liniment, Berry, Demoville & Co..... 8,195
Liniment, W. Bickford..... 8,194
Medicinal preparations, certain, J. G. Brown..... 8,198
Medicinal preparations, certain, J. H. Zeilin & Co.. 8,232, 8,233
Medicine, horse, D. D. Tomlinson..... 8,228
Medicine, tonic, H. Bischoff & Co..... 8,196
Oils, refined, Devoe Manufacturing Company..8,226, 8,227
Ointment, Soler & Guardias 8,222
Pills. castor oil, W. Scruton..... 8,221
Reaping and mowing machines, Adriance, Platt & Co..... 8,191
Salves or ointments and pills, Jahne & Co..... 8,214
Tobacco and cigarettes, chewing and smoking, C. R. Messinger 8,217
Tobacco and cigarettes, smoking and chewing, J. W. Carroll..... 8,199
Tobacco and cigarettes, smoking and chewing, Goodwin & Co..... 8,205
Tobacco, chewing, Goodwin & Co..... 8,206
Tobacco. cigars, and cigarettes, chewing and smoking. Goodwin & Co..... 8,208
Tobacco. cigars, and cigarettes, smoking and chewing, C. G. Emery..... 8,202
Tobacco, cigars, and cigarettes, smoking and chewing, Goodwin & Co..... 8,209
Toilet wash, F. Wright & Brother..... 8,231
Whisky, E. Stern..... 8,220

English Patents Issued to Americans.

From May 13 to May 17, 1881, inclusive.

Chair, window cleaning, Anna Dormitzer, N. Y. city.
Chromographic printing, W. H. Forbes. Boston, Mass.
Drying apparatus, E. H. Potter, New York city.
Heat, conveying, J. Newton, New York city.
Hydrocarbon burner. R. Lighthall, Brooklyn, N. Y.
Iridium, treating, J. Holland. Cincinnati, Ohio.
Joints, mode of making, A. H. Fancher, Brooklyn, N. Y.
Magnetic comb, P. H. Drake, New York city.
Screw propeller, J. B. Root, Port Chester, N. Y.
Smutter machine, M. Deal, Bucyrus, Ohio.
Stone cutting machine, J. Gazely, Albany. N. Y.
Tack driver, G. J. Capewell, Cheshire, Conn.

PATENTS.

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine Improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had *thirty-five years' experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infrigements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

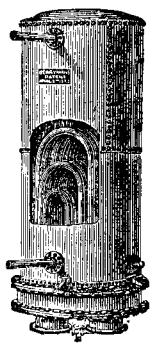
MUNN & CO., Solicitors of Patents,
37 Park Row, New York.

BRANCH OFFICE.—Corner of F and 7th Streets, Washington, D. C.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

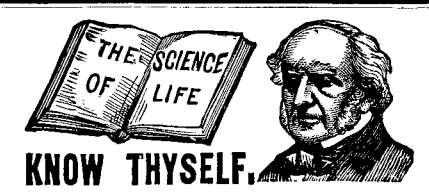


THE BERRYMAN PATENT Feed Water Heater and Purifier

Have been in use ten years, and never require repairs.

I. B. DAVIS & SON, Hartford, Conn.,
Sole Proprietors and Manufacturers in the U. S.

ESSAY ON INVENTIONS.—How to Make a Profitable Invention. Contains information that will enable any inventor to invent a device that will pay. 25c. currency or 1c. stamps. N. DAVENPORT, Valparaiso, Indiana.



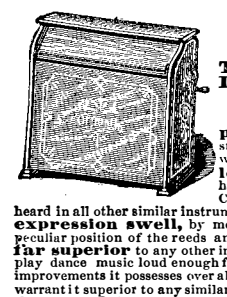
KNOW THYSELF.

BY studying the **Science of Life**; or, **Self Preservation.** It is not only a complete and perfect treatise on Manhood, Exhausted Vitality, Nervous and Physical Debility, Premature Decline in Man, the Errors of Youth, or the excesses and indiscretions of mature years, etc., but it contains one hundred and twenty-five prescriptions for acute and chronic diseases, **each one of which is invaluable,** so proved by the author, whose experience for twenty-one years is such as probably never before fell to the lot of any physician. It contains 300 pages, bound in beautiful embossed covers, full gilt, embellished with the very finest steel engravings, guaranteed to be a finer work in every sense—mechanical, literary, or professional—than any other work retailed in this country for $2.50, or the money will be refunded. Price only $1.25. Gold medal awarded the author by the National Medical Association. Illustrated sample sent on receipt of six cents. Send now.

Address PEABODY MEDICAL INSTITUTE, or Dr. W. H. PARKER, No. 4 Bulfinch St., Boston, Mass. The author may be consulted on all diseases requiring skill and experience.

Telescope For Sale Cheap.—3½ inch object glass. First-class instrument. Apply A. Hudnut, 218 B'way, N. Y.

CARY & MOEN
STEEL WIRE OF EVERY DESCRIPTION & STEEL SPRINGS.
234 W. 29. ST. NEW YORK CITY



THE ORGANITA.

USING PAPER AS A VALVE.

THE FINEST INSTRUMENT OF THE KIND IN THE WORLD. Improved Automatic Shut-off and Double Expression Swell, Fourteen Notes; Full Sized Reeds, and Five Very Powerful Bellows. The Simplest Mechanical Musical Instrument now in the Market.

In response to the almost universal demand from our customers for a very powerful, simple, **low-priced,** and yet attractive instrument, we have produced the **"ORGANITA."** This instrument has **14 notes** or reeds, the same as all other similar instruments, (except our Organinas, which have 16) and is more **simple** in construction, more **attractive** in design, and much **louder** and more **melodious** than other instruments using paper as a valve. Our Organitas have a fine **black walnut** case, handsomely decorated, **five** very powerful bellows, full sized Cabinet Organ reeds, an improved automatic **shut off,** (which prevents the disagreeable noise heard in all other similar instruments when the end of the tune passes over the reeds), and a most ingenious and effective double **expression swell,** by means of which the tune is greatly varied. We obtain an effect from this instrument, owing to the peculiar position of the reeds and the construction of the expression box, **almost equal** to a regular valve instrument, and **far superior** to any other instrument using paper as a valve. Our Organita is almost as **loud** as a Cabinet Organ, and will play dance music loud enough for any medium sized hall. Its attractive shape, *simple* and *powerful* construction, and the various improvements it possesses over all other paper as a valve instruments, will place it at once, *far* in advance of all competitors, and we warrant it superior to any similar musical instrument extant. Price, in black walnut cases, with selection of music, **only $8.00.**

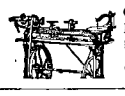
Over 300 tunes now ready.

SPECIAL TO AGENTS. Wishing an agent in every town we have concluded to offer a sample of the Organita to those who will push the sale for **only 5 dollars each. Music 4 cents a foot. This price only applies to Agents. Money refunded if not as recommended.**

MASSACHUSETTS ORGAN CO.,
57 Washington Street, Boston, Mass.

ROBINSON MACHINE WORKS,
POUGHKEEPSIE, N. Y.,
Build Light, Patented Machinery.

ENGINE CASTINGS, 2 H. P., $15; 4 H. P., $20
Circulars free. W. M. BOYD, Box 793, Pittsburg, Pa.



Champion Combination and Youth's Companion Foot Lathes, Amateur Steam Engines & Boilers, Cylinder Saws and Stave Machines. Send stamp for price. Strange's Cylinder Saw & Mach. Co. Taunton Mass.

THE WHITE IS KING.
It has the finest finished wood-work and is the BEST MADE. Its shuttle is self-threading; its needle can be set in the market. So simple in construction and light-running, that a child can use it. It is filled without removing work or attachments.
WARRANTED FOR FIVE YEARS.
Agents can make more money handling the "White" than any other. Address, for particulars,
WHITE SEWING MACHINE CO. CLEVELAND, OHIO.

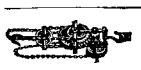
A Good Investment.

BEST FOOT LATHES,
Back geared and screw cutting. Small Lathes, Hand Planers for Metal, Small Gear Cutters, Slide Rests, etc. Just the articles for business. Highly appreciated. Catalogues free.
N. H. BALDWIN,
Laconia, N. H.

STOP the FLOW of FILTH FROM the HEAD. PERMANENT CURE OF **CATARRH**

HOME TREATMENT. NO CHARGE FOR CONSULTATION. The fearful effects of Catarrh on the system can be stopped. Childs Catarrh Treatment is the only known means of positive, permanent cure. Send for description, terms, etc. Address

Rev. T. P. CHILDS, Troy, O.



Thompson's Pat. Steel Hoist M'f'g Co.,
75 & 77 First Ave., Pittsburg, Pa.
Sole M'f'rs for U. S. Catalogues free.

LADY AGENTS WANTED.—We want intelligent, energetic Lady Agents to sell to WOMEN ONLY, an article of real hygienic merit. For particulars and liberal terms, address WAGNER & CO., Chicago, Ill.

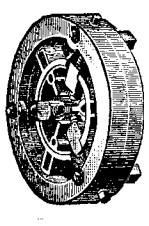
GENUINE CHIAN TURPENTINE REMEDY for Cancer, as recommended by Prof. Clay, of Birmingham. $1 per box; 6 boxes $5. 24-page book explaining all, free. Geo. Nissal, Gen. Agt., 109 W. 34th St., N.Y.

TELEPHONE *Latest, Best.* Patented 1881. Works two miles. Circulars free. HOLCOMB & CO., Mallet Creek, O.

TELEPHONE work one mile. The Loudest Speaking Telephone ever invented. Only $5. Illustrated Circulars sent free. Address NORTH-WESTERN TELEPHONE CO., 384 West Madison St., Chicago, Ill.

FOUND

THE STEAM PUMPS MADE BY
VALLEY MACHINE CO.,
EASTHAMPTON, MASS.,
Are the best in the world for Boiler Feeding and other purposes.



The "SWEETLAND CHUCK," Universal, Independent, and Eccentric. Unexcelled for Accuracy, Strength, Durability, and Simplicity of construction.
SWEETLAND & Co.,
126 Union St., New Haven, Conn.

SHIPWRIGHTS' COMPANY of LONDON.

INTERNATIONAL EXHIBITION, 1882.

A COMPETITIVE EXHIBITION of SHIP MODELS and DESIGNS will be held by the kind permission of the Fishmongers' Company, at their Hall, London, about June, 1882, at which prizes will be offered for Models and Designs for Vessels both for War and the Merchant service.

The COMPETITION will be OPEN to either Naval Architects, Shipbuilders, Shipowners (on behalf of the Designers or Builders), and both English and Foreign Builders, as well as Designers, are invited to compete.

The classes will comprise War Ships, Torpedo Boats, Mercantile Steam and Sailing Ships, American River Steamers, Yachts, Fishing Smacks and Trawlers, Barges, Boats, etc.; also Paintings and Drawings of Ships, and Designs for their External Ornamentation.

For particulars of classification and regulations as to competition, apply, by letter only, to
ALFRED D. LEWIS,
Honorary Secretary Shipwrights' Company Exhibition Committee,
Fishmongers' Hall, London.

165 RACE ST. JAS. MURDOCK JR. CINCINNATI.
MACHINISTS SUPPLIES IN BRASS, COPPER, SILVER, GERMAN
SEND FOR WIRE, ROD, SHEET & TUBE IN THE THREE METALS. PRICE LIST

THE HOOPES ARTIFICIAL STONE, CEMENT & PAINT CO. OF BALTIMORE CITY.

Office, 84 N. Eutaw St., Baltimore, Md.,
Are now ready to negotiate for the organization of Auxillary Companies in all the States and Territories.
Referring only to *work done*, as follows:
U. S. Mint, Philadelphia, - Col. A. L. Snowden, Supt.
Navy Yard, Brooklyn, N. Y., - F. C. Prindle, C. E.
Navy Yard, League Island, Penn., - H. S. Craven, C. E.
Navy Yard, Gosport, Va.. - - P. C. Asserson, C. E.
Navy Yard, Washington, D. C., - A. G. Menocal, C. E.
Navy Yard, Pensacola, Fla., - T. C. McCollom, Supt.
F. L. HAGADORN, Secretary.

GOOD MECHANICS
Of all classes, desiring to secure pleasant homes and steady employment, will do well to apply to the Manager of the Chicago Works, Pullman's Palace Car Company, Pullman, Cook County, Illinois, in person or by letter.

DO YOUR OWN PRINTING
Presses and outfits from $3 to $500
Over 2,000 styles of type. Catalogue and reduced price list free.
H. HOOVER, Phila., Pa.

GREENEBAUM'S COMBINED
Refrigerator, Filter, & Water Cooler.
The most practical, efficient, and reliable Refrigerator ever introduced to the public. **Patented Jan. 21, 1879, and March 8, 1881.** These Refrigerators are manufactured in various styles and sizes, have already been placed on the market, and have a large and increasing sale. **THE ENTIRE PATENTS FOR SALE.**
Address **M. GREENEBAUM,**
139 Lake St., Chicago, Ill.

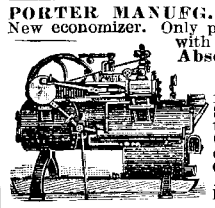
WOODWORKING MACHINERY,

For Railroad Shops, Planing Mills, Car Builders, Cabinet, Carriage, Sash, Door, and Blind Makers.
S. A. WOODS MACHINE CO., 172 High St., Boston; 91 Liberty St., N. Y.; 61 S. Canal St., Chicago.

GET THE BEST AND CHEAPEST.
TRADE PERIN MARK.
Silver Finish.
J. A. FAY & CO.
J. A. FAY & CO.,
(Cincinnati, Ohio, U. S. A.)
Exclusive Agents and Importers for the United States, of the
CELEBRATED
PERIN BAND SAW BLADES,
Warranted ***superior to all others in quality, finish, uniformity of temper,*** and ***general durability.*** One ***Perin Saw*** outwears ***three*** ordinary saws.

BEATTY'S ORGANS, 18 useful stops, 5 sets reeds, only **$65. Pianos, $125** up. Illus. Catalogue FREE. Address **BEATTY,** Washington, N. J.

PORTER MANUFG. CO., Lim.
New economizer. Only portable made with return flue. **Absolute safety from explosion** and from sparks. Send for cirs. to Porter Mfg. Co., Lim., Syracuse, N.Y. G. G. Young, Gen. Agt., 42 Courtlandt St., N.Y.



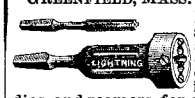
The Literary Revolution.

To keep in good humor the good people who delight in good books; to wake up the slow booksellers who are inclined to go to sleep in the summer, instead of, like a 'possum, in the winter; and to prevent our friends, the **Cheap Books** book publishers, from forever getting us, we have concluded to publish a few more cheap books. If we are to name him at all, we must, of course, head the list with the immortal **Shakespeare** Shakespeare, and will give you either his "Merchant of Venice" or "Hamlet," or any one of his fourteen other principal plays, in beautiful type, for 3 cents. At the same price you may have **Three Cents.** Macaulay's "Life of Frederick the Great," former price $1.25, or Carlyle's "Robert Burns," or Lamartine's "Life of Mary Queen of Scots," or Thomas Hughes's "Manliness of Christ." **Washington Irving.** Washington Irving's wonderful, delightful, heretofore inaccessible "Sketch Book," which contains the incomparable Rip Van Winkle, you can have for a dime. For the same price **A Dime.** **Tom Brown** we will give you "Tom Brown at Rugby," the best boy's book ever written, except "Robinson Crusoe," which you can have also for 10 cents each. To charm those who **Crusoe.** delight in fiction, we give also for 10 cents, Cooper's "Last of the **Cooper's** Mohicans," one of the most justly celebrated American novels, and Charles Kingsley's "Hypatia," **Mohicans.** which worthily rank at the very front of famous historical fiction. These are only specimens of the cheap books we publish, are all in good type, neatly printed, and are not in the broad side or any other "side" or "square" style, but handy pocket volumes, of course in paper binding. Our motto, however, has always been that a book worth reading is worth preserving, as well as worth owning, and our large list of standard books, to which we are making additions, with speed unprece dented in the history of publishing, are all elegantly and strongly bound, in cloth or better style, and so d at prices proportionately low with those in paper covers. We issue these few only in pamphlet form, as specimens of the quality of our good literature, and these special terms will not be long continued throughout the **5,000 Booksellers** United States and Canada are prepared to either abundantly supply or liberally slander our publications. We give liberal terms to clubs where no bookseller acts as agent. Descriptive Catalogue, and illustrated pamphlet describing book-making and type-setting by steam, will be sent free, on request. **AMERICAN BOOK EXCHANGE, 764 Broadway, New York.**
JOHN B. ALDEN, Manager

40 Lovely Floral, Panel, Hand & Bouquet Chromo Cards, with name 10c. Franklin Pr'tg Co., New Haven, Ct.

GLUCOSE—A COLLECTION OF VALUABLE technical papers on the manufacture of this important commercial product. The American manufacture of corn glucose. The conversions—Starch, Dextrine, Complete Glucose. Depreciation of a glucose factory. Fire risks of glucose factories and manufactures. Glucose factory ignitions and fires. The Hirsh improved process of manufacturing sugar from corn. Wolff's improved process. Furbish's process of glucose manufacture. Pigeon's improved process of manufacturing the same. Full details of each method. Illustrated with two cuts. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **259** and **260.** Price 10 cents each. To be had at this office and from all newsdealers.

WILEY & RUSSELL M'F'G COMPANY,
GREENFIELD, MASS. "LIGHTNING" (trade mark),



Manufacturers of Screw Cutting and other labor-saving Machinery and Tools. Bolt Cutters for hand or power in large variety. The celebrated *Lightning Screw Plates* in various assortments. Taps, dies, and reamers for use in the bit-brace. *The Green River Tire Upsetter.* Green River Drilling Machines. Green River Tire Benders, Horse Shoers' Vises, Tire Wheels, Tire Bolt Wrenches, Nut Wrenches, Countersinks, etc., etc. *Send for illustrated price list.*

GREAT IMPROVEMENTS

RECENTLY MADE IN

CRUSHING AND GRINDING

GOLD AND SILVER ORES, BONES, PHOSPHATE ROCK, & CHEMICALS. We compel Quartz to grind Quartz.
Address for new circular
BAUGH & SONS, Philadelphia.

MACHINE KNIVES
FOR PAPERMILLS, BOOKBINDERS, WOOD WORKING AND AGRICULTURAL MACHY. ALSO PARALLEL VISES FOR MACHINISTS, PIPE FITTERS, BLACKSMITHS, WHEELWRIGHTS PATTERN MAKERS &C.
MANUFACTURED BY TAYLOR STILES & CO.
RIEGELSVILLE WARREN CO. N.J.

Steel Castings

From ¼ to 15,000 lb. weight, true to pattern, of unequaled strength, toughness, and durability. 15,000 Crank Shafts and 10,000 Gear Wheels of this steel now running prove its superiority over other Steel Castings. Send for circular and price list.
CHESTER STEEL CASTINGS CO., 407 Library St., Phila, Pa.

© 1881 SCIENTIFIC AMERICIAN, INC

The Phosphor-Bronze Smelting Co. Limited.

New Offices and Salesroom, 512 Arch Street, PHILADELPHIA PA.

PHOSPHOR-BRONZE

Wire, Rods, Sheets, Bolts, etc.

Pamphlets and Particulars on Application.

OWNERS OF THE U. S. PHOSPHOR-BRONZE PATENTS.

Sole Manufacturers of Phosphor-Bronze in the U.S.

PATENT COLD ROLLED SHAFTING.

The fact that this shafting has 15 per cent. greater strength, a finer finish, and is most to gauge, than any other in use renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS' PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price list mailed on application to JONES & LAUGHLINS, Try Street, 2d and 3d Avenues, Pittsburg, Pa. Corner Lake and Canal Sts., Chicago, Ill.

☞ Stocks of this shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass. Geo. Place Machinery Agency, 121 Chambers St., N. Y.

ORNAMENTAL INITIALS.—A COMplete alphabet of ornamental initials in Old English Text, very useful for painters, decorators, and those interested in the art of illumination. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 259. Price 10 cents. To be had at this office and from all newsdealers.

Pond's Tools,

Engine Lathes, Planers, Drills, &c.

DAVID W. POND, Worcester, Mass.

Send for Circular & Price List of

COPE & MAXWELL M'F'G CO'S

New and Improved Styles of

STEAM PUMPS

—AND—

BOILER FEEDERS.

"THE BEST MADE."

Address HAMILTON, OHIO.

HUB MACHINERY.—HUB TURNING, HUB MORTISing, and Hub Boring Machines. Send for price list and circulars. DAVID JENKINS, Sheboygan, Wis.

TEMPORARY DEAFNESS.—BY H. A. Wilson, M.D. A valuable clinical lecture dealing more especially with that form of the complaint which is due to impacted cerumen. The various causes that conspire to produce an excess of wax in the ears, and how it is to be prevented or treated. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 264. Price 10 cents. To be had at this office and from all newsdealers.

Shafts, Pulleys, Hangers, Etc.

Full assortment in store for immediate delivery.

WM. SELLERS & CO., 79 Liberty Street, New York.

ELEVATORS, Steam and Hand Power, Automatic Hatch Doors, etc. CLEM & MORSE, 411 and 413 Cherry St., Philadelphia, Pa.

NO MORE USE FOR OIL ON MACHINERY

Oline Lubricating Compound, manuf'd by HOLLAND & THOMPSON, Troy, N. Y. Avoids hot journals, dripping, and waste. Send for catalogue of Grease and Cups for all kinds of machinery.

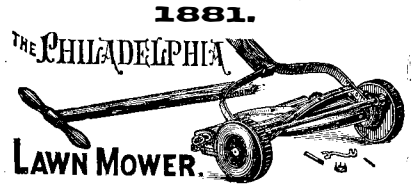
DRUNKENNESS And the OPIUM Habit CURED

By LESLIE E. KEELEY, M.D., Surgeon, C. & A. R. R. Dwight, Ill. ☞ Books Free.

TYPHOID FEVER.—A CLINICAL LECture, by Prof. Austin Flint, M.D., giving the various symptoms by which the disease may be recognized and distinguished from other fevers, and pointing out the proper methods of treating it. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 251. Price 10 cents. To be had at this office and from all newsdealers. The same number contains an article on a "New Treatment for Typhoid Fever."

Ahead of all Competition.

1881.



TEN SIZES FOR HAND USE.

Weighing from 21 to 51 lbs.

THREE SIZES FOR HORSE POWER.

GRAHAM, EMLEN & PASSMORE,

Patentees and Manufacturers,

631 Market St., Philadelphia, Pa.

CONSTIPATION VIEWED AS A DISease *per se* and as an Exciting Cause of Disease.—A valuable paper by Robert Bell, M.D., calling attention to a matter which is often overlooked in connection with this disorder, *i. e.*, the production of a whole host of distressing symptoms, and the development of what, but for it, might still remain latent disease. Illustrated by a series of cases which have come under the author's observation during the last six years, and giving the treatment adopted by him. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 224. Price 10 cents. To be had at this office and from all newsdealers.

FURNACE GRATE BARS.

206 WEST ST., NEW YORK.

The best and cheapest. *Send for Circular.*

Get These Good Books

The standard, beautiful, and incomparably cheap books of the Literary Revolution are in demand far beyond our resources for manufacturing them. We must manufacture and sell **quickly** immense editions of these books in order that we may afford the low prices, and that we may transfer our capital to the manufacture and sale of still **While You Can** other standard books for which we are having most urgent demands. If, therefore, you want any of the books named below, **order them promptly,** as we shall after a few days cease to manufacture these editions, and they will then not be obtainable in the market.

Books 2 Cents.

Handy form, paper covers.

The Gospel of Matthew, Revised Version.
" " Mark, " "
" " Luke, " "
" " John, " "

Books 3 Cents.

Handy form, paper covers. Formerly sold at $1.25 each.

Carlyle's Life of Robert Burns.
Macaulay's Life of Frederick the Great.
Shakespeare's Hamlet.
" Merchant of Venice.
" 14 other principal Plays, each.
Lamartine's Life of Mary Queen of Scots.
Thomas Hughes's The Manliness of Christ.

Books 5 Cents.

Handy form, paper covers.

The Choice of Books, by Charles F. Richardson.
The Light of Asia, by Edwin Arnold.
Bunyan's Pilgrim's Progress; price 6 cents.

Books 10 Cents.

Handy form, paper covers.

The Sketch Book, by Washington Irving.
Robinson Crusoe, by Daniel De Foe.
Tom Brown's School Days, by Thomas Hughes.
Hypatia, by Charles Kingsley.
Last of the Mohicans, by J. Fenimore Cooper.
The New Testament, Revised Version.

Books 15 Cents.

Handy form, paper covers.

Knickerbocker, by Washington Irving.
Jane Eyre, by Charlotte Bronte.
Romola, by George Eliot.
Uarda, an Egyptian Princess, by Ebers.
Corinne, by Madame de Staël.
Ivanhoe, by Sir Walter Scott.
Last Days of Pompeii, by Bulwer.
John Halifax, Gentleman, by Mrs. Mulock Craik.

Books 25 Cents.

Beautiful books, *elegant cloth binding.*

The Light of Asia, by Edwin Arnold.
The Choice of Books, by Charles F. Richardson.
Carlyle's Heroes and Hero Worship.
Smiles's Brief Biographies.

Books 30 Cents.

Beautiful books, *elegant cloth binding.*

Knickerbocker, by Washington Irving.
Homer's Iliad, translated by Pope.
Homer's Odyssey, translated by Pope.
Works of Virgil, translated by Dryden.
Works of Dante, translated by Cary.
Last of the Mohicans, by J. Fenimore Cooper.
Tom Brown's School-Days, by Thomas Hughes.
Reminiscences, by Thomas Carlyle.
The Koran of Mohammed, translated by Sale.
The New Testament, Revised Version.

Books 35 Cents.

Beautiful books, *elegant cloth binding.*

Creasy's Decisive Battles of the World.
The Sketch Book, by Washington Irving.
Jane Eyre, by Charlotte Bronte.
Corinne, by Madame de Staël.
Hypatia, by Charles Kingsley.
John Halifax Gentleman, by Mrs. Mulock Craik.
Last Days of Pompeii, by Bulwer.
Ivanhoe, by Sir Walter Scott.
Romola, by George Eliot.

Books 40 Cents.

Beautiful books, *elegant cloth binding.*

Carlyle's History of the French Revolution.
Goethe's Wilhelm Meister, translated by Carlyle.
Milton's Poetical Works.
Tasso's Jerusalem Delivered.
Baron Munchausen and Gulliver's Travels, illustrated.
Æsop's Book of Fables, illustrated.

Books 50 Cents.

Beautiful books, *elegant cloth binding.*

Adventures of Don Quixote, illustrated.
Masson's French Dictionary (formerly $1.50).
American Patriotism.—Famous Orations.
Geikie's Life of Christ.
Smith's Bible Dictionary.
Green's Larger History of the English People, 2 vols., $1.
Grote's History of Greece, 4 vols., $2.
Chambers's Cyclopædia of English Literature, 4 vols., $2.

A Cyclopaedia War.

CHAMBERS'S ENCYCLOPÆDIA REDUCED FROM $50 TO $6. The Library of Universal Knowledge, 10 per cent larger than Appleton's, 20 per cent larger than Johnson's; 15 vols., large type, $15. ORDER QUICK, BEFORE THE WAR IS OVER. Specimen pages free.

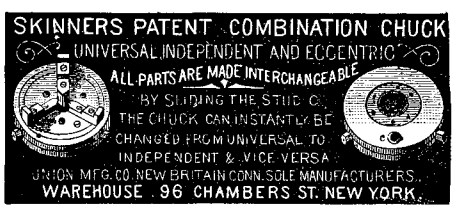
5,000 Booksellers slander or supply our publications. **Terms to Clubs**

We allow the following terms to clubs: On 3 copies of any one book, 5 per cent discount; on 5 copies, 10 per cent; on 10 copies, 15 per cent; or on $50 net selected from the list, 15 per cent discount. Descriptive catalogue and illustrated pamphlet describing book-making and type-setting by steam will be sent free on request.

AMERICAN BOOK EXCHANGE,

JOHN B. ALDEN, MANAGER. 764 Broadway, New York.

General Agents: Boston, H. L. Hastings, 47 Cornhill; Philadelphia, Leary & Co.; Cincinnati, Robert Clarke & Co.; Indianapolis, Bowen, Stewart & Co.; Cleveland, Ingham, Clarke & Co.; Chicago, Alden & Chadwick, 120 Dearborn street; San Francisco, Cunningham, Curtiss & Welch; St. Louis, Logan D. Dameron; Atlanta, Ga., J. J. & S. P. Richards; Baltimore, W. E. C. Harrison; Richmond, Randolph & English; Pittsburg, James Robison; Grand Rapids, Mich., Eaton, Lyon & Co.; Minneapolis, S. M. Williams.


SKINNERS PATENT COMBINATION CHUCK
UNIVERSAL INDEPENDENT AND ECCENTRIC
ALL PARTS ARE MADE INTERCHANGEABLE
BY SLIDING THE STUD C
THE CHUCK CAN INSTANTLY BE
CHANGED FROM UNIVERSAL TO
INDEPENDENT & VICE VERSA
UNION MFG. CO. NEW BRITAIN CONN. SOLE MANUFACTURERS.
WAREHOUSE 96 CHAMBERS ST. NEW YORK.

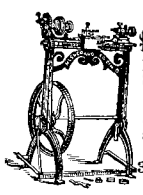
SURFACE FILE HOLDERS.

By their use a crooked file may be utilized as well as a straight one, and *both* are made to do better execution in filing broad surfaces than has hitherto been possible.

No. 4 holds files 12 to 14 in. long. Price 75c. each.
No. 5 " " 14 to 16 in. " Price $1.00 each.

For sale by the trade generally. Manufactured only by the NICHOLSON FILE CO., Providence, R. I.

$66 a week in your own town. Terms and $5 outfit free. Address H. HALLETT & Co., Portland, Me.



SHEPARD'S CELEBRATED

$60 Screw Cutting Foot Lathe.

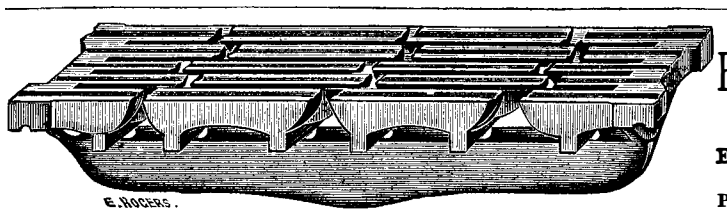
Foot and Power Lathes, Drill Presses, Scrolls, Circular and Band Saws, Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Calipers, etc. Send for catalogue of outfits for amateurs or artisans.

H. L. SHEPARD & CO., 331, 333, 335, & 337 West Front Street, Cincinnati, Ohio.

70 YOUR NAME In New Type on 70 Cards 10c

New styles, by best artists: *Bouquets, Birds, Gold Chromos, Landscapes, Water Scenes, etc.*—no two alike. Agent's Complete Sample Book, 25c. Great variety *Advertising and Bevel-Edge Cards.* Lowest prices to dealers and printers. 100 *Samples Fancy Advertising Cards,* 50c. Address STEVENS BROS., Box 22, Northford, Ct.

ROPER'S HAND BOOK OF LAND AND Marine Engines. With illustrations. By Stephen Roper, Engineer. *Fourth edition.* Tuck, gilt edge. Price $3.50. Sent by mail, postage prepaid, on receipt of price. E. CLAXTON & CO., 930 Market St., Philadelphia, Pa.



W. C. WREN'S

Pat. Grate Bar,

Manufactured by

D. S. CRESWELL,

Eagle Iron Foundry,

816 RACE ST.,

PHILADELPHIA, PA.

MACHINERY

of every description. 121 Chambers and 103 Reade Sts., New York, THE GEORGE PLACE MACHINERY AGENCY.

$5 to $20 per day at home. Samples worth $5 free. Address STINSON & Co., Portland, Me.

THE LARGEST MACHINERY DEPOT IN AMERICA.

STANDARD MACHINERY FOR ALL PURPOSES.

H. B. SMITH MACHINE CO.

ESTAB'D 1849. 925 MARKET ST. PHILADELPHIA.

50 BEAUTIFUL ALL NEW DESIGNS of Butterfly, Dragon-fly, Robin Redbreast, Pinks, Pansies, Violets, and Moss Rosebud Chromo Cards, name on, 10c. Card Mills, Northford, Ct.

W. S. HOLLAND & CO., Burlington, Vt., Manufacturers of all kinds Hives and Honey Sections. Also Walnut Cabinets for Druggists and Merchants, Small Packing Boxes, etc.

THE

Hancock Inspirator,

THE BEST BOILER FEEDER KNOWN.

Over 17,000 in use on Locomotive, Stationary, Marine, and Portable Boilers.

THE HANCOCK INSPIRATOR CO., BOSTON, MASS.

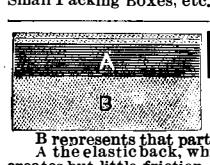
VOLNEY W. MASON & CO.,

FRICTION PULLEYS, CLUTCHES, and ELEVATORS,

PROVIDENCE, R. I.

NEW & VALUABLE OILER FOR LOOSE PULLEYS.

Its use on Loose Pulleys, or Idlers, especially those running at a high speed, will prove it to be efficient, keeping the pulley oiled from three to four weeks with one filling. Guaranteed to *give satisfaction.* Manufactured by VANDUZEN & TIFT, Cincinnati, O.



RUBBER BACK SQUARE PACKING.

BEST IN THE WORLD.

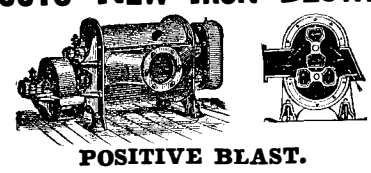
For Packing the Piston Rods and Valve Stems of Steam Engines and Pumps.

B represents that part of the packing which, when in use, is in contact with the Piston Rod. A the elastic back, which keeps the part B against the rod with sufficient pressure to be steam-tight, and yet creates but little friction.

This Packing is made in lengths of about 20 feet, and of all sizes from ¼ to 2 inches square.

JOHN H. CHEEVER, Treas. NEW YORK BELTING & PACKING CO., 37 & 38 Park Row, New York.

ROOTS' NEW IRON BLOWER.



POSITIVE BLAST.

IRON REVOLVERS, PERFECTLY BALANCED

IS SIMPLER, AND HAS

FEWER PARTS THAN ANY OTHER BLOWER.

P. H. & F. M. ROOTS, Manuf'rs,

CONNERSVILLE, IND.

S. S. TOWNSEND, Gen. Agt., 6 Cortlandt St., 8 Dey Street,
WM. COOKE, Selling Agt., 6 Cortlandt Street,
JAS. BEGGS & CO., Selling Agts., 8 Dey Street,
NEW YORK.

☞ SEND FOR PRICED CATALOGUE.

THE DINGEE & CONARD CO'S BEAUTIFUL EVER BLOOMING ROSES

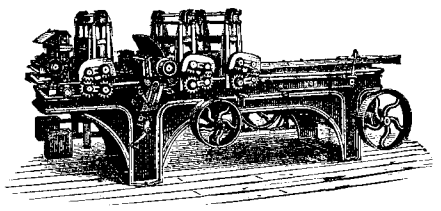
The only establishment making a SPECIAL BUSINESS OF ROSES. 50 LARGE HOUSES for ROSES alone. We deliver Strong Pot Plants, suitable for immediate bloom, safely by mail, postpaid, at all post-offices. 5 splendid varieties, your choice, all labeled, for $1; 12 for $2; 19 for $3; 26 for $4; 35 for $5; 75 for $10; 100 for $13. We GIVE AWAY, in Premiums and Extras, more ROSES than most establishments grow. Our NEW GUIDE, *a complete Treatise on the Rose,* 70 pp. *elegantly illustrated,* describes 500 newest and choicest varieties—*free to all.*

THE DINGEE & CONARD CO. Rose Growers, West Grove, Chester Co., Pa.

$72 A WEEK. $12 a day at home easily made. Costly outfit free. Address TRUE & Co., Augusta, Me.

FIRST STEPS IN CHEMISTRY.

A 96 pp. book well illustrated, containing a series of 150 Brilliant Experiments, sent free for 6 one cent stamps. Chemical Cabinets, with material for performing 50 to 100 Experiments, from 25 to 50 cents. W. T. SHERIDAN, 200 Hooper St., Brooklyn, N. Y.



WITHERBY, RUGG & RICHARDSON. Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ball & Co., Worcester, Mass. Send for Catalogue.

ROOFING.

For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 32 John Street, New York.

COILED GEARS WIRE BELT & SASH CORD. AGENTS WANTED. SEND FOR CIRCULAR TO THE P.T.P. CO. 328 7TH AVE. N.Y. PATENT

"The 1876 Injector."

Simple, Durable, and Reliable. Requires no special valves. Send for illustrated circular.

WM. SELLERS & CO., Phila.

ICE-HOUSE AND REFRIGERATOR.—Directions and Dimensions for construction, with one illustration of cold house for preserving fruit from season to season. The air is kept dry and pure throughout the year at a temperature of 34° to 36°. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, 116. Price 10 cents. To be had at this office and of all newsdealers.

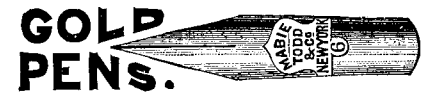
FIRE BRICK. TILE AND CLAY RETORTS ALL SHAPES. BORGNER & O'BRIEN. 23 RD ST. ABOVE RACE. PHILADELPHIA.

$55.66 Agents' profit per week. Will prove it or forfeit $500.00. Outfit and Samples worth $5.00 free. Address E. G. RIDEOUT & CO., 10 Barclay Street, New York.

Agents Wanted. Sells rapidly. Particulars *free.* **Cost 4S Sells 50** S. M. SPENCER, 112 Wash'n St., Boston, Mass.

ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield. With directions for construction. Four engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, 59. Price 10 cents. To be had at this office and of all newsdealers.

GOLD PENS.



PENCILS, HOLDERS, CASES, &c.

The CALLI-GRAPHIC Pen.

A GOLD PEN and RUBBER HOLDER, containing ink for several days' writing. Can be carried in the pocket. Always ready for use. A luxury for persons who care to preserve their individuality in writing.

MABIE, TODD & BARD, 180 BROADWAY, NEW YORK.

Send for Price-List.

OUR GOODS ARE SOLD BY FIRST-CLASS DEALERS.

CARNEGIE BROS & CO. UNION IRON MILLS PITTSBURGH PA. WROUGHT IRON BEAMS CHANNELS TEES & ANGLES

The attention of Architects, Engineers, and Builders is called to the great decline in prices of wrought STRUCTURAL IRON.

It is believed that, were owners fully aware of the small difference in cost which now exists between iron and wood, the former, in many cases, would be adopted, thereby saving *insurance* and avoiding all risk of *interruption* to *business* in consequence of fire. Book of detailed information furnished to Architects, Engineers, and Builders, on application.

© 1881 SCIENTIFIC AMERICIAN, INC

THE
New York Ice Machine Company,
115 Broadway, New York, Room 78.

LOW PRESSURE BINARY ABSORPTION SYSTEM.

Machines Making

ICE AND COLD AIR.

Low Pressure when running. No pressure at rest. Machines guaranteed by C. H. Delamater & Co.

HOLDS INK FOR A WEEK'S USE.

THE MacKinnon Iridium Pointed Pen, OR FLUID PENCIL.
THE ONLY RESERVOIR PEN IN THE WORLD WITH A CIRCLE OF IRIDIUM AROUND THE POINT. Cannot blot. Always ready. Always with you. Cannot blot. Cannot be worn out in a lifetime.
MacKINNON PEN CO., 192 Broadway, cor. John St., New York.
General Supply Depots in all principal cities in America and Europe.

ANY GOOD INK MAY BE USED.

BRASS AND COPPER — COE BRASS MFG. CO. WOLCOTTVILLE CONN. MATERIALS FOR METALLIC AMMUNITION A SPECIALTY. — WIRE AND BLANKS IN SHEETS

MAXIM AUTOMATIC PUMPING ENGINE raises 250 gallons of water per hour with a gas burner. Costs $40. Thousands sold for $200. Half interest in patent for sale very low.
H. S. MAXIM, 120 Broadway, New York.

Steam Fitters' & Plumbers' Supplies.
STURTEVANTS' FAN BLOWERS.
ALBERT BRIDGES, 46 Cortlandt Street, New York.

THE BAKER BLOWER.
[FORCED BLAST.]

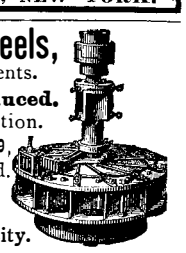
The revolving parts are all accurately Balanced.
Warranted Superior to any other.
WILBRAHAM BROS,
No. 2318 Frankford Avenue
PHILADELPHIA, PA.
SEND FOR OUR CATALOGUE.

SHAPING MACHINES.
Six in. stroke, with counter shaft and chuck, price $135.
BOYNTON & PLUMMER, Worcester, Mass.

NEW YORK BELTING AND PACKING COMPANY

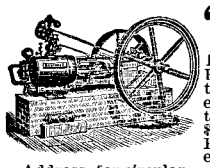
OUR "TEST" HOSE
Is superior to anything ever before made. Every description of Rubber Hose always in stock.
37 & 38 PARK ROW, NEW YORK.

Leffel Water Wheels,
With recent improvements.
Prices Greatly Reduced.
8000 in successful operation.
FINE NEW PAMPHLET FOR 1879,
Sent free to those interested.
James Leffel & Co,
Springfield, O.
110 Liberty St., N. Y. City.



ICE AT $1.00 PER TON.
PICTET ARTIFICIAL ICE CO., Limited, P. O. Box 3083. 142 Greenwich St., New York.
Guaranteed to be the most *efficient* and *economical of all* existing Ice and Cold Air Machines.

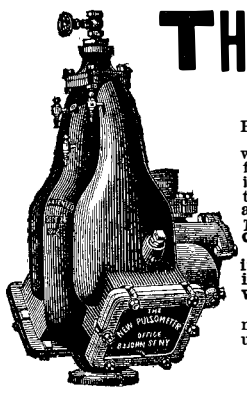
ASBESTOS FELTING WORKS, 80 Cortland Street, New York.
Steam Pipe and Boiler Covering. Fireproof Hair Felt. Roofing, Roofing Materials, Building Paper and Paints.



"RELIABLE"
Engines a complete success. Prices still 40 per cent. below those of other makers. Unequaled for efficiency, simplicity, and durability. Prices from $250 for 10 H. P. to $550 for 50 H. P. All complete, with Governor, Pump and Heater.
Address for circular,
HEALD & MORRIS, formerly HEALD, SISCO & CO., Baldwinsville, N. Y.

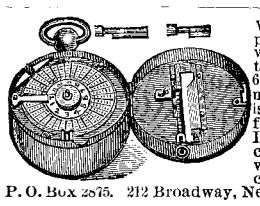
H.W.JOHNS' ASBESTOS LIQUID PAINTS
ROOFING, BOILER COVERINGS,
Steam Packings, Mill Board, Gaskets,
Sheathings, Fire-proof Coatings, Cements, &c.
SEND FOR DESCRIPTIVE PRICE-LISTS.
H. W. Johns M'f'g Co., 87 Maiden Lane, N. Y.

THE Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts. Philadelphia, and 50 Gold St. New York.



THE NEW PULSOMETER.
FIRE! FIRE!! FIRE!!!
From NATIONAL LINE, Pier No. 39, North River, Foot of Houston Street.
PULSOMETER STEAM PUMP CO.: NEW YORK, May 19, 1881.
In addition to my memo. dated March 3, I specially desire to inform you of the working of your No. 7 Pulsometer as a fire extinguisher. After having done with it for the purpose that it was intended for (pumping water from the coffer dam), I had it placed in the fire room simply for storage in case it should be required again for the same purpose. Afterwards it was put up for washing down the wharf, and applying a 1¼ inch nozzle, salt water was drawn from the river, and thrown a perpendicular distance of 100 feet; so in case of fire on any part of the pier, the pump can be set working almost instantly.
I congratulate you on the improvements I have discovered you have made and its many uses it can be applied to. We are always ready to exhibit it to those looking for such a pump, and every pier and warehouse where steam is used should not be without a New Pulsometer. Yours truly, GEO. L. ANDREWS. Wharfinger.
Send for book giving full description, reduced prices, and many letters of commendation from leading manufacturers and others throughout the country who are using them.
PULSOMETER STEAM PUMP CO., Office, No. 83 John St., N. Y. City.
Chicago Office: 193 Lake Street—H. T. CASWELL.

ERICSSON'S
New Caloric Pumping Engine
FOR
DWELLINGS AND COUNTRY SEATS.
Simplest cheapest, and most economical pumping engine for domestic purposes. Any servant girl can operate. Absolutely safe. Send for circulars and price lists.
DELAMATER IRON WORKS
C. H. DELAMATER & CO., Proprietors,
No. 10 Cortlandt Street, New York, N. Y.



WATCHMAN'S IMproved Time Detector, with Safety Lock Attachment, Patented 1875-6-7. Beware of Infringements. This Instrument is supplied with 12 keys for 12 different stations. Invaluable for all concerns employing night watchmen. Send for circulars to E. IMHAUSER,
P. O. Box 2675. 212 Broadway, New York.

BOYLE ICE MACHINE CO.,
Ice Machines
AND
Refrigerating Apparatus.
No. 10 N. Jefferson Street, Chicago, Ill.
Estimates and Circulars upon Application.

Mill Stones and Corn Mills.
We make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys, and Gearing specially adapted to Flour Mills. Send for catalogue.
J. T. NOYE & SONS, Buffalo, N. Y.

COLUMBIA BICYCLE.
The Bicycle has proved itself to be a permanent, practical road vehicle, and the number in daily use is rapidly increasing. Professional and business men, seekers after health or pleasure, all join in bearing witness to its merits. Send 3 cent stamp for catalogue with price list and full information.
THE POPE M'F'G CO.,
597 Washington Street, Boston, Mass.

BOILER COVERINGS.
Plastic Cement and Hair Felt, with or without the Patent "AIR SPACE" Method.
ASBESTOS MATERIALS.
Made from pure Italian Asbestos, in fiber, mill board, and round packing. THE CHALMERS-SPENCE CO., 10 Cortland Street, and Foot of E. 9th Street, New York.

SHAFTS PULLEYS HANGERS
At Low Prices. Large Assorted Stock.
A. & F. BROWN, 57-61 Lewis St., New York.

BOGARDUS' PATENT UNIVERSAL ECCENTRIC MILLS—For grinding Bones, Ores, Sand, Old Crucibles, Fire Clay, Guanos, Oil Cake, Feed, Corn, Corn and Cob, Tobacco, Snuff, Sugar, Salts, Roots, Spices, Coffee, Cocoanut, Flaxseed, Asbestos, Mica, etc., and whatever cannot be ground by other mills. Also for Paints, Printers' Inks, Paste Blacking, etc. JOHN W. THOMSON, successor to JAMES BOGARDUS, corner of White and Elm Sts., New York.

SASH DOVETAILING MACHINE.

Planers, Moulding Machines, Mortisers and Borers, Tenoning Machines, Blind Rabbeting Machines; also, a large variety of other wood working machines manufactured by
LEVI HOUSTON, Montgomery, Pa.

COMPOUND OXYGEN — NOT A DRUG

A NEW TREATMENT for Consumption, Asthma, Bronchitis, Catarrh, Dyspepsia, Headache, Debility, Neuralgia, Rheumatism, *and all Chronic and Nervous Disorders.*
ACTS DIRECTLY upon the great nervous and organic centres, and *cures by a natural process of revitalization.*
HAS EFFECTED REMARKABLE CURES, which are attracting wide attention.
HAS BEEN USED BY Rt. Rev. John J. Keane, Bishop of Richmond, Va., Hon. Wm. D. Kelley, T. S. Arthur, and others, who have been largely benefited, and to whom we refer *by permission.*
IS STRONGLY ENDORSED: "We have the most unequivocal testimony to its curative power from many persons of high character and intelligence."—*Lutheran Observer.* "The cures which have been obtained by this new treatment seem more like miracles than cases of natural healing."—*Arthur's Home Magazine.* "There is no doubt as to the genuineness and positive results of this treatment."—*Boston Journal of Commerce.*
THE OXYGEN HOME TREATMENT contains two months' supply, with inhaling apparatus and full directions for use.
SENT FREE: a Treatise on Compound Oxygen, giving the history of this new discovery and a large record of most remarkable cures. Write for it. Address
ADMINISTERED BY INHALATION. Drs. STARKEY & PALEN, 1109 and 1111 Girard St., Philadelphia, Pa.

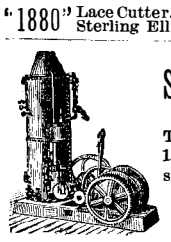
FRIEDMANN'S PATENT
EJECTORS
Are the cheapest and most effective machines in the market for
Elevating Water and Conveying Liquids
from Mines, Quarries, Ponds, Rivers, Wells, Wheel Pits; for use in R. R. Water Stations, Factories, etc. They are splendidly adapted for conveying liquids in Breweries, Distilleries, Sugar Refineries, Paper Mills, Tanneries, Chemical Works, etc. Send for illus. catalogue to
NATHAN & DREYFUS,
Sole Manufacturers, NEW YORK.

RAIL ROAD DEPOTS IRON BUILDINGS WHARF SHEDS
SUGAR HOUSES "SELF FITTING" COTTON STORES
PUBLIC MARKETS (CATALOGUES GRATIS) RETORT HOUSES
WALTER C. BERGIUS & CO.—GLASGOW—SCOTLAND.

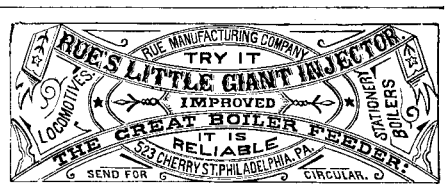
WM. A. HARRIS,
PROVIDENCE, R. I. (PARK STREET),
Six minutes walk West from station.
Original and Only builder of the
HARRIS-CORLISS ENGINE
With Harris' Patented Improvements, from 10 to 1,000 H. P.

MICROSCOPES *Opera Glasses, Spectacles, Telescopes, Barometers, Thermometers,* and *Compasses.* R. & J. BECK, Manufacturing Opticians, Philadelphia, Pa.
Send for Illustrated Priced Catalogue.

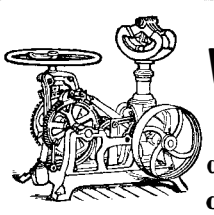
"1880" Lace Cutter. By mail, 50c. Discount to the trade. Sterling Elliott, 262 Dover St., Boston, Mass.



PATENT
Steam Hoisting Machines.
Four Sizes—4 to 10 Horse Power. The Four Horse Power will raise 1,200 lb. 150 feet per minute. Other sizes in proportion.
NOBLE & HALL,
ERIE, PA.



MACHINISTS' TOOLS.
NEW AND IMPROVED PATTERNS.
Send for new illustrated catalogue.
Lathes, Planers, Drills, &c.
NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.

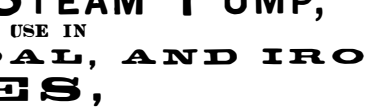


SNOW'S BEST
Water Wheel Governor,
MANUFACTURED BY
COHOES IRON FOUNDRY AND MACHINE CO.,
COHOES, - - N. Y.

SCREW PRESSES.
STILES & PARKER PRESS CO., Middletown, Conn.

Working Models
And Experimental Machinery, Metal or Wood, made to order by J. F. WERNER, 62 Centre St., N. Y.

Round Writing
USEFUL FOR EVERYBODY



Text Book, with Instruction and Pens, $1.50.
KEUFFEL & ESSER, 127 Fulton St., New York.

THE CAMERON STEAM PUMP,
DESIGNED FOR USE IN
GOLD, SILVER, COAL, AND IRON MINES,
ALSO FOR GENERAL MANUFACTURING AND
FIRE PUMPS.
Pumps furnished with Movable Linings in Iron, Composition, or Phosphor-Bronze.
Address THE A. S. CAMERON STEAM PUMP WORKS,
FOOT EAST 23d STREET, NEW YORK CITY.

CATALOGUED.
THE FOLLOWING MANUFACTURERS ARE PROMINENT IN THEIR RESPECTIVE LINES; IN SHORT, ARE HEADQUARTERS:

WIRE ROPE
THE HAZARD MANUFG. CO.,
Works at Wilkes Barre, Pa. 87 Liberty St., N. Y.

HOISTING ENGINES.
COPELAND & BACON,
85 LIBERTY ST., NEW YORK.

MACHINISTS' TOOLS AND SUPPLIES.
H. PRENTISS & COMPANY,
14 Dey St. (P. O. Box 3362), New York.

ROCK DRILLS & AIR COMPRESSORS.
INGERSOLL ROCK DRILL CO.,
1 1-2 Park Place, - - New York.

Establ'd **EAGLE ANVILS.** 1843.
Solid CAST STEEL Face and Horn. Are Fully Warranted. Retail Price, 10 cts. per lb.

Double Screw, Parallel, Leg Vises.
Made and WARRANTED *stronger* than any other Vise by FISHER & NORRIS only, Trenton, N. J.

EXETER MACHINE WORKS,
Manufacturers of
Steam Engines, Blowers, and Steam Heating Apparatus.
50 Federal St., Boston, Mass.

The Greatest Rock Breaker on Earth.
Capacity, a ton a minute. All kinds of Mining Machinery. Send for circulars. GATES & SCOVILLE IRON WORKS, Chicago, Ill.

STEARNS SAW MILLS.
Saw Mill Machines, Boilers, and Engines.
STEARNS MANUFACTURING COMPANY, Erie, Pa.

The Howard Manufacturing Co.
Address, No. 364 BROADWAY, NEW YORK,
MANUFACTURE AND INTRODUCE
PATENTED NOVELTIES.

Parker's Pocket Scale.

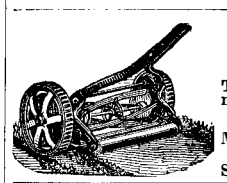
For Sale by Dealers in Sportsmen's Goods, Or Write to Howard M'f'g Co., New York.
COMPACT, STRONG, DURABLE.
CAN BE CARRIED IN THE VEST POCKET.
PRICE 25 CENTS.

KORTING'S UNIVERSAL INJECTORS
For Boiler Feeding, operated by single handle, taking water up to 150° Fah.
Philadelphia Office, 12th and Thompson Sts.; New York Office, 109 Liberty St.; Boston Office, 7 Oliver St.

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

BRADLEY'S CUSHIONED HAMMER
BRADLEY & COMPANY SYRACUSE, N. Y.

Jenkins' Patent Packing and Valves.
"THE STANDARD."
Jenkins' Packing has *never failed* to make a perfect joint where directions were followed. Jenkins' Valves are warranted steam tight and are made of the best steam metal. JENKINS BROS., 71 John St., New York.



"BUCKEYE" LAWN MOWER.
The lightest and easiest running MOWER ever made.
STRICTLY FIRST CLASS.
MAST, FOOS & CO., Springfield, Ohio.
Send for catalogue.

Jarvis Furnace Co.
Patent Setting for Steam Boilers, Burns' Screenings and Slack Coal without Blast. No. 7 Oliver St., Boston; No. 422 East 23d St., New York; No. 709 Market St., St. Louis; No. 1 Second St., Baltimore.

PRINTING INKS.
The leading Periodicals, including the SCIENTIFIC AMERICAN, are printed with our inks.
G. MATHER'S SONS, 60 John St., New York.

© 1881 SCIENTIFIC AMERICIAN, INC